SPECIFICATIONS

FOR

UNION COUNTY PARKING DECK AT CALDWELL PLACE & ELIZABETHTOWN PLAZA,

CITY OF ELIZABETH, COUNTY OF UNION, NEW JERSEY

BA#38-2021; UNION COUNTY ENGINEERING PROJECT #2019-026

JULY 2021

UNION COUNTY
BOARD OF COUNTY COMMISSIONERS

Alexander Mirabella, Chairman
Rebecca L. Williams, Vice Chair
Angela R. Garretson, Commissioner
Sergio Granados, Commissioner
Christopher Hudak, Commissioner
Bette Jane Kowalski, Commissioner
Lourdes M. Leon, Commissioner
Kimberly Palmieri-Mouded, Commissioner
Andrea Staten, Commissioner

CLERK OF THE BOARD
James E. Pellettiere, RMC

COUNTY MANAGER
Edward T. Oatman

DEPARTMENT OF ENGINEERING, PUBLIC WORKS AND FACILITIES MANAGEMENT
Joseph A. Graziano, Sr., CPWM
Director, Department of Engineering, Public Works and Facilities Management

COUNTY ENGINEER
DIVISION OF ENGINEERING
Thomas O. Mineo, P.E.

Prepared by:

Lehrer Cumming
200 South Avenue East
Cranford, NJ 07016

Netta Architects
1084 Route 22 West
Mountainside, NJ 07092

Revised: 2020.02.19

COUNTY OF UNION
NOTICE TO BIDDERS

Sealed bids will be received by the assistant director of the Division of Purchasing, or her designee, at the County of Union, New Jersey on **September 8, 2021 at 11:30 a.m**., prevailing time, in the **3rd Floor Conference Room**, U.C. Administration Building, 10 Elizabethtown Plaza, Elizabeth, New Jersey for:

Union County Parking Deck at Caldwell Place & Elizabethtown Plaza
City of Elizabeth,
County of Union, New Jersey
BA# 38-2021; Union County Engineering Project #2019-026

Bid Packages may be obtained at no charge by registering and downloading at http://ucnj.org/bid-specs. Bid Packages may also be obtained in person from the Division of Engineering at 2325 South Avenue, Scotch Plains, New Jersey 07076 between 8:30 a.m. and 4:00 p.m. weekdays upon payment of a non-refundable money order or bank check in the amount of $275.00 made payable to the County of Union. No Personal / Company checks will be accepted. Requests for mailing of specifications will not be honored. For further information please call 908-789-3675.

The County reserves the right to reject any and all bids and to waive any and all informalities in the bid in accordance with the New Jersey Local Public Contracts Law.

***Public access to the County of Union Administration Building is currently restricted during the statewide public health emergency. Accordingly there will not be an in-person public opening but instead will be conducted live and streamed via the County of Union live streaming platform which will feature both audio and video capabilities. A link will be provided on the day of the opening at https://ucnj.org/.

Bidders on this project are required to be pre-classified by the State of NJ, Division of Property Management and Construction (DPMC) under classifications #C008 (General Construction), #021 (Demolition), #C030 (Plumbing), #C032 (HVACR), #C045 (Sprinkler Systems), #C047 (Electrical), #C092 (Asbestos Removal/Treatment), as well as other documentary requirements in the INSTRUCTION TO BIDDERS found in the bid specification. If the Bidder himself does not have the required classification(s) as stated above, the Bidder must include and identify a subcontractor(s), of any tier, who has the required classification(s) in the List of Subcontractors.

Please note the successful bidder will be required to sign a *PROJECT LABOR AGREEMENT (PLA)* for this project. A form PLA is included in the bid package for your review. Further, take note of all documents referring to the PLA and any action required on same.

A **pre-bid meeting** will be held on August 12, 2021 at 10:30 am. **Attendance is highly recommended**. The meeting will be located at the existing U.C. Parking Deck at the corner of Caldwell Place and Elizabethtown Plaza, City of Elizabeth, New Jersey. Specific questions regarding the project will be addressed at the pre-bid meeting.

Bids shall be submitted in a sealed envelope and clearly marked with the subject of the bid, name and address of the bidder, phone & fax number, and date of the bid opening. Each bid must be delivered to reach the Division of Purchasing prior to the stated time of the opening of the bids. The County will not be responsible for late delivery by the U.S. Mail or any other carrier. Hand delivery of proposals are strongly discouraged due to public restrictions. If delivered by hand, you will not receive confirmation of delivery. **No** late bids will be accepted.

Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

***Entire bid packages received will be scanned and available for public inspection on the portal, http://ucnj.org/itb, as they would be available for public inspection after an in-person bid opening. Bidders are reminded to review their submissions for any information they consider to be confidential. The County will not be responsible for the release of any information contained in the bid package which may be subject to confidentiality.

MICHELLE HAGOPIAN, ASSISTANT DIRECTOR OF PURCHASING

Union County Parking Deck at Caldwell Place & Elizabethtown Plaza
City of Elizabeth,
County of Union, New Jersey
BA# 38-2021; Union County Engineering Project #2019-026

TABLE OF CONTENTS

GENERAL SPECIFICATION CONTINUED:

BIDDING DOCUMENTS

BID DOCUMENTS CONTINUED:

Statement of Bidder's Qualifications
Contractor Performance Record
Affidavit Regarding List of Disbarred, Suspended or Disqualified Bidders
Prior Negative Experience Questionnaire-Certification
Contractor's Certification of Compliance - New Jersey Prevailing Wage Act
Uncompleted Contracts Affidavit
Certificate of Insurance Statement
Collection of Use Tax on Sales to Local Governments Statement
Acknowledgement of Project Labor Agreement Requirements
Time of Completion
Disclosure of Investment Activities in Iran

SS - STANDARD SPECIFICATIONS SS-1

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR AIA DOCUMENT A-101/2017
(Sample form until contract is awarded**)**

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A-201/2017
(Sample form until contract is awarded**)**

NEW JERSEY PREVAILING WAGE DETERMINATION DOCUMENTS

PROJECT TECHNICAL SPECIFICATIONS

APPENDICES TO TECHNICAL SPECIFICATIONS

APPENDIX 1 – GEOTECHNICAL INVESTIGATION REPORT – PREPARED BY REMINGTON & VERNICK ENGINEERS

APPENDIX 2 – PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT & PRE-DEMOLITION ASBESTOS ABATEMENT WORK PLAN – PREPARED BY OMEGA ENVIRONMENTAL SERVICES, INC.

APPENDIX 3 – TEMPORARY TRAFFIC CONTROL PLAN

PROJECT DRAWINGS

UNION COUNTY BOARD OF COUNTY COMMISSIONERS
INSTRUCTIONS TO BIDDERS AND FORMS

DEFINITIONS

Wherever reference is made to the County, Title of Project, Bidder, or Vendor/Contractor they shall be as follows:

OWNER/COUNTY:
Union County Board of County Commissioners
UC Administration Building, 6th Floor
10 Elizabethtown Plaza
Elizabeth, New Jersey 07207

ADDRESS INQUIRIES TO:
Union County Division of Purchasing
UC Administration Building, 3rd Floor
10 Elizabethtown Plaza
Elizabeth, NJ 07207
Attn: Michelle Hagopian, Assistant Director, Division of Purchasing
Telephone: 908-527-4130
Facsimile: 908-558-2548
ucbids@ucnj.org

ADDRESS BIDS AND SUBMIT TO:
Union County Division of Purchasing
UC Administration Building, 3rd Floor
10 Elizabethtown Plaza
Elizabeth, NJ 07207
Attn: Michele Hagopian, Assistant Director, Division of Purchasing
Telephone: 908-527-4130
Facsimile: 908-558-2548

TITLE OF PROJECT: Union County Parking Deck at Caldwell Place & Elizabethtown Plaza, City of Elizabeth, County of Union, New Jersey, BA# 38-2021; Union County Engineering Project #2019-026

BIDDER: Bidder shall be a single overall contract bidder

ARCHITECT: Netta Architects

COUNTY ENGINEER AND/OR CONSTRUCTION MANAGER (as applicable):

COUNTY ENGINEER:
Thomas O. Mineo, P.E.
Union County
Division of Engineering
2325 South Avenue
Scotch Plains, NJ 07076
Office: (908) 789-3675
Facsimile: (908) 789-3674 Email: tmineo@ucnj.org

CONSTRUCTION MANAGER: Lehrer Cumming

GENERAL SPECIFICATIONS

1. BID FORM

Bids for this Work will be enclosed in a sealed envelope addressed to the Purchasing Division, County of Union, New Jersey, Union County Administration Building, 10 Elizabethtown Plaza, Elizabeth, New Jersey 07207, with the full name of the Project clearly marked on the outside. Refer to the sheet marked "Notice of Bid (Advertisement)" for the correct name of the Project. Bidders must submit their bids on the attached pricing sheet (Bid Form), in a sealed envelope addressed to the County and bearing on the outside: the name of the Bidder, Bidder's business address, and the title of the Project.

The Division of Purchasing will receive the bids for this Work at the Union County Administration Building, 10 Elizabethtown Plaza, Elizabeth, New Jersey on the date and time noted on the sheet marked "**Notice of Bid (Advertisement)**".

The County will not assume responsibility for bids forwarded by mail. It is the individual's responsibility to see that the bids are presented to the Purchasing Division at the time and at the place designated.

Bids will be accepted only on the Bid Form supplied. Bids on forms other than the original supplied herein will be rejected. The "complete" Bid Documents includes the Bid Bond, Bid Form, Bidder's Checklist, Consent of Surety, Ownership Disclosure Certification, Non-Collusion Affidavit, and any other documents noted in these Instructions to Bidders or Contract Document to be submitted with this Bid. (See AIA Owner/Contractor Agreement & General Conditions attached.)

The bidder will state in the bidding sheet the price per unit of measure for each scheduled Item of Work for which he will agree to carry out the Work, and the Total Bid Price for the construction of the Project.

The prices in the Bid Form shall be typed or written in pen and ink. Erasures or alterations must be initialed by the bidder in ink.

The bidding sheet for this Project may include a fixed amount as a Bid Allowance. If applicable, all bidders are required to add this fixed amount to their base bid and to include this additional amount in their Bid Bond. This sum will be included in the Contract as well as the performance, labor and materials bond. Payment by the County will be made to the Contractor from these funds only upon the completion of extra Work pursuant to a written Change Order(s) signed by the County's Engineer or his designee and the Contractor, prior to the commencement of such Work. Work commenced prior to written approval by the County shall be done at Contactor's risk. Such payment will only be in

the amount agreed to by the parties, in writing in the Change Order(s). See Section 39, Change Orders, of these general specifications for further details.

Refer to Bid Document Submission Checklist for all required documents.

In the event there is a discrepancy between the unit price given and the extended total, the unit price will govern. Any discrepancies will be mathematically adjusted.

Insert applicable alternates, if any have been specified, applicable to the Bidder's Work. All alternates MUST be bid upon. Any Bidder's failure to do so will be deemed a material, non-waivable defect and shall render the bid nonresponsive. The Bidder shall clearly designate whether the change in price is an addition or subtraction, by using either a "+" sign or the word "addition", or in the alternative, a "-"sign or the word "minus". If there is no other change in price, the Bidder shall insert "NC" or "No Charge".

When two or more low bids are equal in all respects, awards will be made according to the provisions of N.J.S.A. 40A:11-6.1(d).

Where unit prices have already been established by the Contract Documents, the Bidder agrees that such unit prices shall prevail. All unit prices, whether filled in by the Bidder or established by the Contract Documents, shall become part of the Contract. No bid will be considered or award made, unless applicable unit prices, as required, are filled in.

The County reserves the right to reject any or all bids and also reserves the right to waive any informality in the bids received so long as said waiver is not of a response which is considered to be material and non-waivable pursuant to law.

The County of Union has the right to reject any and all bids from any bidder that is in, or contemplates bankruptcy of any chapter of nature. Said bidder shall notify the County, in writing, of any condition or knowledge of the same.

Conditional bids will not be accepted. Bids may be withdrawn prior to the advertised time for the opening of bids or authorized postponement thereof or in accordance with the provisions of N.J.S.A. 40A:11-23.3 discussed below. Bids received after the advertised time shall not be considered. Bidders shall be solely responsible for premature opening or late delivery of bids not properly marked, addressed, or directed.

2. WITHDRAWAL OF BID DUE TO MISTAKE

N.J.S.A. 40A:11-23.3 authorizes a bidder to request withdrawal of a public works bid due to a mistake on the part of the bidder. A mistake is defined by N.J.S.A. 40A:11-2(42) as a clerical error that is an **unintentional and substantial computational error** or **an unintentional omission of a substantial quantity of labor, material, or both, from the final bid computation.**

A bidder claiming a mistake under N.J.S.A. 40A:11-23.3 must submit a request for withdrawal, **in writing,** by certified or registered mail to Michele Hagopian, Assistant Director, Division of Purchasing, County of Union, New Jersey, Union County Administration Building, 10 Elizabethtown Plaza, Elizabeth, New Jersey 07207. The bidder must request withdrawal of a bid due to a mistake, as defined by the law, within five business days after the receipt and opening of the bids. Since the bid withdrawal request shall be effective as of the postmark of the certified or registered mailing, Michele Hagopian, Assistant Director of the Division of Purchasing or his designee may contact all bidders, after bids are opened, to ascertain if any bidders wish to, or already have exercised a request to withdraw their bid pursuant to N.J.S.A. 40A:11-23.3.

A bidder's request to withdraw the bid **shall** contain evidence, including any pertinent documents, demonstrating that a mistake was made. Such documents and relevant written information shall be reviewed and evaluated by the County's designated staff pursuant to the statutory criteria of N.J.S.A. 40A:11-23.3.

The County will not consider any written request for a bid withdrawal for a mistake, as defined by N.J.S.A. 40A:11-2(42), by a bidder in the preparation of a bid proposal unless the postmark of the certified or registered mailing is within the five business days following the opening of bids.

3. QUALIFICATIONS OF BIDDERS AND REQUIRED SUBMISSIONS

The County may make such investigation as it deems necessary to determine the ability of the Bidders to perform the Work, which includes investigation of any and all subcontractors listed with the bid. The Bidder shall furnish any information and data for this purpose as the County may request.

4. INTERPRETATIONS AND ADDENDA

Any explanation desired by a bidder regarding the meaning or interpretation of the Contract Documents must be requested in writing to the County Engineer or Design Professional as the case may be and with reasonable time allowed for a reply to reach bidders before submission of their bids. Any interpretation or instruction made by the County Engineer will be in the form of an addendum to the Contract Documents or clarification and will be furnished to all prospective bidders. Oral explanations or instructions given before the award of the Contract will not be binding. Bidders are required to bring to the attention of the County Engineer, the discovery of any apparent ambiguity, inconsistency, error, discrepancy, omission in the Contract Documents for interpretation and correction at least ten (10) working days before opening of bids with the exception of Saturdays, Sundays and holidays.

All Addenda issued through the Offices of the County Engineer are amendments to the Contract Documents and shall be considered in preparing bids. Same shall become part of the Contract Documents.

Addenda take precedence over all earlier documents and over each other according to the latest date. Addenda unless themselves interpretive remain subject to interpretation the same as any other document incorporated in the Contract.

Addenda may be issued by the County Engineer up to seven (7) working days prior to the opening of bids. Failure of any bidder to receive an addendum shall not relieve such bidder from the obligation imposed by such addendum. Bidders are to keep themselves currently acquainted with the Contract Documents during the entire bidding period and make inquiry on their own initiative as to issuance of any Addenda. Receipts of all Addenda shall be acknowledged on the "*Acknowledgement of Receipt of Changes*" included in the bid package and must be submitted with the bid.

5. OBLIGATION OF BIDDER TO INSPECT SITE AND CONTRACT DOCUMENTS

At the time of the opening of bids, each Bidder will be presumed to have inspected the site(s) and to have read, and be thoroughly familiar with the Contract Documents. The failure or neglect of any Bidder to receive or examine any form, instrument, or document shall in no way relieve any Bidder from any obligation in respect to its bid.

The Bidder shall examine the contents of the Project Manual and the set of Drawings and assure itself that all pages of the Specifications, Drawings, and other Contract Documents are included in the documents obtained for bidding purposes. Should the Specifications, Drawings, and other Contract Documents be incomplete, the Bidder shall notify the County Engineer in writing, who will supply the Bidder with any missing pages of Specifications, Drawings, or other Contract Documents. The lack of such written notification by the Bidder will be construed as evidence that the Specifications, Drawings, or other Contract Documents supplied it for bidding purposes are full and complete and as a waiver of any subsequent claim to the contrary.

6. BID AND PERFORMANCE GUARANTEE

Each bidder must furnish a Bid Bond, Certified Check or Bank Cashier's Check in the amount of ten percent (10%) of the Bid. Checks shall be drawn to the order of the County of Union, New Jersey, not to exceed $20,000.

Each bidder must furnish with the bid a certificate from a Surety Company, i.e. Consent of Surety, stating that in the event of the contract being awarded to said bidder, such Surety Company will provide the Contractor with Bonds guaranteeing the faithful performance of the Work in accordance with the plans and specifications, and the payment for labor, materials, and all other indebtedness which may accrue on the account of this Work. A Performance, Labor and Materials bond will be furnished by the Contractor upon an award of Contract, and will be in the amount of 100% of the contract price.

A one-year Maintenance Bond will be required upon acceptance of the Project by the County in the amount as stated in Section 17 of the General Specifications. Bonds will be written by a firm authorized to issue the bonds under the laws of the State of New Jersey and be in a form acceptable to the County Counsel.

N.J.S.A. 40A:11-1.1 et seq. allows the prime Contractor to furnish the Performance Security for his Subcontractors. The County of Union requires Performance Security to be furnished by the prime contractor for the entire job in the total amount of the contract.

The County of Union shall award the contract or reject all bids within sixty (60) days; except that the bids of any bidders who consent thereto may, at the request of the County be held for consideration for such longer periods as may be agreed.

The County will return all certified checks or cashier's checks after the proposals have been opened, read, tabulated and checked except those of the three (3) bidders who have bid the lowest total price for carrying out the Project. The County will return the checks of these bidders when a contract is awarded to the successful bidder within ten (10) days after the award of the contract.

If the successful bidder refuses or neglects to sign the said Agreement and furnish the required bonds, the Bid Bond will be held and used by the County to offset any damages for such refusal or neglect.

7. COMMENCEMENT AND COMPLETION

Work will not commence until a Notice to Proceed is received from the County Engineer.

Upon substantial completion of the Project, the Contractor must request a joint inspection with the County Engineer. Upon completion of this inspection, the County Engineer will prepare a list of incomplete or incorrect items (punch list) and have Contractor initial and date same. The Contractor shall rectify all deficiencies noted on the punch list within 30 calendar days of receipt of the list. The County Engineer may approve extensions for extenuating circumstances.

8. BIDDER AFFIDAVIT

All Bidders are required to complete, sign, and submit with their Bid, the attached "Affidavit Regarding List of Debarred, Suspended or Disqualified Bidders". (See form enclosed)

9. CLASSIFICATION AND QUALIFICATION OF BIDDERS

Pursuant to Ordinance Number 557-2002 as adopted by the County on September 5, 2002, all bidders on contracts for public works shall be classified and qualified in accordance with N.J.S.A. 40A:11-25 as well as N.J.S.A. 52:35-1 et seq. (See Section 53 of the General Specifications)

This provision shall not apply to subcontractors.

10. UNCOMPLETED CONTRACTS (BUILDING PROJECTS ONLY)

The Bidder shall submit a current Classification/Prequalification Certificate and accompanying form(s) indicating the dollar amount of uncompleted contracts, and a notarized and itemized list of these uncompleted contracts in the form provided, with their bid. (See form enclosed)

11. BID SECURITY

All Bidders are required to submit a form of Bid Security with their bids.
(Bid Bond or Certified Funds)

The Bid Security shall be in the amount of ten percent (10%) of the Bid, but not in excess of Twenty Thousand Dollars ($20,000.00), and payable to the order of the "County of Union."

12. LABOR AND MATERIALS

The prices will cover all costs of any nature incident to and growing out of the Work, including all labor, material, equipment, transportation, loss by damage or destruction of the Project, settlement of damages, and for replacement of defective work or materials. N.J.S.A. 54:32B-1 et seq. exempts all materials sold to the County of Union from sales or use taxes and should not be included in the prices provided on the Bidding Sheet.

13. INSURANCE REQUIREMENTS

The County of Union requires all contractors to be able to comply with the following insurance requirements. In the event a bid is accepted by the County, the contractor must accept the applicable insurance requirements, as set forth below, as part of any contract awarded to it by the County.

Contractor shall carry and maintain at all times while the contract is in full force and effect, the following insurance coverage with an insurance company or companies acceptable to the County, with limits not less than those shown below. A Certificate of Insurance, shall be filed with the County prior to commencement of any Work indicating the following:

a) Commercial General Liability (CGL): Coverage for all operations including, but not limited to, contractual, products and completed operations, and personal injury with limits no less than $5,000,000 per occurrence/$10,000,000 aggregate. The County of Union, its Board of County Commissioners, officers, employees, agents and servants shall be included as an additional insured. Coverage is provided on a primary and on-contributory basis to the County of Union, et al.

b) Automobile Liability: Coverage for all owned, non-owned and hired vehicles with limits not less than $5,000,000 per occurrence, combined single limits (CSL) or its equivalent.

c) Workers Compensation: As required by the State of New Jersey and Employers Liability with limits not less than $1,000,000 per accident for bodily injury or disease.

d) Professional Liability (if design/build): Coverage with limits not less than $1,000,000 per occurrence or claim, $2,000,000 aggregate

e) Contractor's Pollution Legal Liability and/or Asbestos Legal Liability and/or Errors & Omissions (if project involves environmental hazards): Coverage with limits no less than $1,000,000 per occurrence or claim/$2,000,000 aggregate.

f) Builders Risk (for major renovations): During the course of construction utilizing an "All Risk" coverage form with limits equal to the completed value of the project and no coinsurance penalty provisions.

Where applicable, a waiver of subrogation in favor of the County of Union, its Board of County Commissioners, officers, employees, agents, servants and the State of New Jersey is to be included in those policies of insurance where permitted by law.

Notice of Cancellation: Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the Entity.

Special Risks or Circumstances: The County reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

14. INDEMNIFICATION REQUIREMENTS

The County of Union requires all bidders to accept the following indemnification requirements in the event the County accepts their bid. The Contract awarded by the County to the successful bidder will contain the following provision:

> "To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the owner and the owner's consultants, agents, representatives, and employees from and against any and all claims, damages, losses, costs, and expenses, including, but not limited to attorneys' fees, legal costs and legal expenses arising out of or resulting from the performance of the Contractor's work under this contract, provided that such claim, damage, loss, cost, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) caused or alleged to be caused by the negligent acts, negligent omissions, and/or fault of the Contractor, anyone

directly or indirectly employed or retained by the Contractor, or anyone for whose acts the Contractor may be liable regardless of whether caused in part by the negligent act or omission of a party indemnified hereunder provided it is not caused by the sole negligence of a party indemnified hereunder. Contractor shall further indemnify and hold harmless the County and the County's consultants, agents, representative, and employees from and against any and all claims, damages, losses, costs, and expenses, including, but not limited to attorneys' fees, legal costs and legal expenses, arising out of or resulting from performance of the work, provided that such claim, damage, loss, cost, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) caused or alleged to be caused by the negligent acts, negligent omissions, and/or fault of the County or the County's consultants, agents, representatives, or employees and arises out of this project and provided such claim, damage, loss, cost, or expense is not caused by the sole negligence of a party indemnified hereunder."

15. ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall hold the County harmless from loss on account thereof.

16. PLANS AND SPECIFICATIONS

In carrying out the Work, the plan(s) and the specifications will be followed by the Contractor. Minor alterations in the plan may be made or permitted by the County Engineer from time to time and, if no additional Work is necessary, there will be no additional charge for carrying out such minor alterations.

The Contractor shall provide the County Engineer a set of reproducible as-built drawings upon completion of the Project. The Contractor shall maintain an updated construction progress plan in the Project field office at all times.

When applicable, The New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, as amended, and Supplemental Specifications for State Aid Projects, herein after referred to as the "Standard Specifications", are made a part of these specifications and contract for the improvements, and will govern the construction of this Project, the material used and the execution of this Project, except as revised and modified herein. The references to these specifications are given herein for the purpose of aiding in the rapid location of the description of the various items herein specified. The entire Work must be carried on and completed to the satisfaction of the County. The Standard Specifications are amended as follows:

"Any reference to the Commissioner, Department, Department Laboratory, Engineer or Inspector should be redefined to be the County of Union".

17. GUARANTEE AGAINST DEFECTIVE WORK

Prior to final payment being made or before the release of the performance security required by Section 3 above, the Contractor and Surety shall execute and deliver to the County an original Maintenance Bond with an original signature and seal having a penal sum equal to:

A) One hundred percent (100%) of the final adjusted Contract amount, if such amount is $50,000.00 or less;
B) Fifty percent (50%) of the final adjusted Contract amount, if such amount be greater than $50,000.00 but less than $250,000.00; and,
C) Twenty-five percent (25%) of the final adjusted contract amount, if such amount is $250,000.00 or more.

The Bond and Surety shall be satisfactory to the Union County Counsel. The Surety shall hold a Certificate of Authorization to do business in the State of New Jersey and shall conform to P.L. 1995 c.384, codified as N.J.S.A. 2A:44-143, 144. The Surety Disclosure Statement and Certification required by N.J.S.A. 2A: 44-143, 144, shall be attached to the Bond. Such Maintenance Bond shall remain in full force and effect for a period of one (1) year from the date of Final Completion. Such Maintenance Bond shall also provide that the Contractor and the Surety guarantee to replace for the said period of one (1) year from the date of Final Completion, all Work performed and/or all materials furnished that were not performed or were not furnished in accordance to the terms and performance requirements of the Contract Documents, and will make good any defects thereof which become apparent before the expiration of one (1) year. If, during that period, any part of the Project, in the judgment of the Engineer, is found defective, the Contractor will repair or replace same within five (5) days of receipt of notice from the County Engineer. If the Contractor refuses or neglects to do such Work in the time specified, the County Engineer may have the Work done by others and the Contractor or his Surety thereof will pay the cost.

The Contractor will furnish the County a Maintenance Bond for a percentage of the final adjusted contract price, as stated above. The one (1) year period will start the day of Final Completion of Project by the County. Final payment is conditional on the receipt of a maintenance bond in a form acceptable to County Counsel.

18. TRAFFIC AND STREET MAINTENANCE

The Work must be started and performed by the Contractor in such a manner as to minimize delays to the traveling public. It must be completed in a timely fashion, with little or no inconvenience to traffic and pedestrians, where such inconvenience may be avoided.

All municipal, county, and state roadways shall remain open to traffic unless otherwise provided for in the technical specifications.

If modified traffic patterns are authorized in order to provide a safe working or traveling environment, the Contractor is responsible for providing all equipment, barrels, cones, signs, and barricades to implement the work zone and detours, unless otherwise specified in the technical specifications. All work zones and detours shall be established in accordance with the technical plans and specifications if provided or in strict compliance with the current version of the Manual for Uniform Traffic Control Devices (MUTCD). The Contractor shall obtain approval for these work zones and detour plans from the Municipal Police or applicable police agency and the Union County Bureau of Traffic Maintenance prior to implementation.

All traffic control plans shall provide for safe movement of vehicular, bicycle, and pedestrian traffic. Particular attention shall be given to requirements of the Americans with Disabilities Act.

No portion of any street or alleyway may be used for the storage of any materials or equipment without the approval of the Municipal Police or other applicable police agency. Sidewalks, gutters, drains, fire hydrants and private drives shall be maintained for their intended use unless specifically approved by the County Engineer.

Upon suspension of Work, at the end of the day or for protracted periods, the Contractor shall remove all rubbish and materials from the Work site to the approved storage/staging location. All road cuts, saw cuts, and trenches that may pose hazard to vehicular, pedestrian, or bicycle traffic, to include handicapped users, shall be filled to the surface of the roadway or sidewalk. At no time will steel plates or settled trenches be allowed at the daily suspension of Work, unless specifically approved by the County Engineer.

Use of Traffic Control Officers shall be determined by the County in accordance with the provisions of N.J.S.A. 40A:11-23.1(c). If applicable to the Project, the County shall have provided an allowance for same as set forth in the Bid Form.

With respect to pedestrian traffic, the Contractor shall install signs restricting access of the general public and, as necessary, Union County employees to the area of construction. The Contractor shall provide safe access to required areas and place physical barriers to restricted areas. These barriers may range from caution tape to actual barriers, at the direction of the County Engineer.

19. CONTRACTOR'S EMPLOYEES

The Contractor must employ only suitable and competent labor in the Work, and must remove from the Work any incompetent, unsuitable, or disorderly person upon complaint from the County Engineer.

The parties to any contract resulting from this proposal do hereby agree that the provisions of N.J.S.A. 10:2-1 through 10:2-4 (discrimination in employment on public works contracts): 34:11-56.25 et seq. (payment of prevailing rate of wages determined pursuant to N.J.S.A. 34:11-56.30 by the Commissioner), and the Rules and Regulations promulgated pursuant thereto, are hereby made a part of any contract and are binding upon them.

There will be no discrimination against any employee who is employed in the Work to be covered by any contract resulting from this bid because of age, race, creed, color, national origin, ancestry, marital status or sex.

Any person, firm, or corporation violating the provisions of this Section will be deemed and judged a disorderly person.

20. OWNERSHIP DISCLOSURES REQUIRED

Pursuant to P.L. 1977, N.J.S.A. 52:25-24.2, the Bidder shall submit with its Bid, or prior to receipt of bids, a statement setting forth the names and addresses of all stockholders in the corporation or partnership bidding who own ten percent (10%) or greater interest therein. (See forms attached)

21. NON-COLLUSION AFFIDAVIT

The Bidder shall submit with its bid either the attached completed “Non-Collusion Affidavit” or a statement of non-collusion with verbiage similar to same.

22. EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCES

The successful bidder shall be required to complete and submit an Initial Project Workforce Report, New Jersey Department of Treasury Form AA-201, upon notification of award. Failure to submit this completed form may result in the Contract being terminated.

The successful bidder shall also be required to submit a copy of its Monthly Project Workforce Report, New Jersey Department of Treasury Form AA-202, to the New Jersey Department of Treasury’s Division of Public Contracts Equal Employment Opportunity Compliance and to the Board.

23. COMPLIANCE WITH NEW JERSEY PREVAILING WAGE ACT

The County of Union, in order to fulfill the requirements of N.J.S.A. 34:11-56.25 et seq., requires that the following additional conditions be strictly followed. The bidders represent that he is not listed or is not on record in the Office of the Commissioner or the Department of Labor and Workforce Development and Industry as one who failed to pay prevailing wages in accordance with the provisions of this Act. The bidder agrees to the inclusion of a contract provision upon award which specifically requires said Contractor to fully comply with each and all of the requirements of the aforesaid Act as it relates to prevailing rates of wages on public contracts as set forth in the New Jersey Prevailing Wage Act, P.L. 1963, Chapter 150 and P.L. 1974, Chapter 64.

A Copy of the Prevailing Wage Rates is attached for your reference. Applicable rates are those wages and fringe benefit rates in effect on the date the contract is awarded. All predetermined rate increases listed at the time the contract award must also be paid, beginning on the dates specified. Rates may change between the time of issuance of this determination and the award of the public works contract. Therefore, prior to the award of the contract, verification must be made with the Public Contracts section, to insure that the rates contained in this determination are still prevailing.

The Contractor agrees to abide and be bound by each and all of the said statutory provisions with respect to the payment of prevailing rates of wages, and acknowledges that the County reserves the right to terminate the Contractor's (or his subcontractors') right to proceed with the scope of Work, or such portion thereof that relates to the failure to pay prevailing rates of wages. In such event or under the terms of N.J.S.A. 34:11-56.27, the Contractor and his surety will be liable to the County of Union for any excess costs occasioned by such a violation.

The Contractor or subcontractors for this Project will post the Prevailing Wage Rates for each craft and classification involved as determined by the Commissioner of Labor and Industry, including the effective date of any changes thereof, in prominent and easily accessible places at the site of the Work or at such place or places as are used by them to pay workmen their wages.

The County of Union requires a copy of payroll records from the Contractor and subcontractors. Payroll records shall be submitted with each voucher request for payment. Prevailing wage rates may be obtained from the New Jersey Labor, Division of Workplace Standards, Public Contracts Section, (609-292-2259).

In addition to compliance with the New Jersey Prevailing Wage Act, the County requires compliance with Resolution No. 2014-0408 adopted by the Board of County Commissioners on MAY 8, 2014. The resolution is furnished in Section 53 of these General Specifications.

UNION LABOR IS PREFERRED ON ALL COUNTY WORK AND, WHERE NOTED, SUBJECT TO A PROJECT LABOR AGREEMENT TO BE EXECUTED BY THE CONTRACTOR AND CONSTRUCTION MANAGER PRIOR TO COMMENCEMENT OF THE WORK. FAILURE OF ANY CONTRACTOR TO COMPLY WITH THIS PROVISION CONSTITUTES A DEFAULT, RESULTING IN IMMEDIATE STOPPAGE OF THE WORK. ANY LOSSES OR OTHER DAMAGES INCURRED BY OTHER PARTIES AS A RESULT OF SAID DEFAULT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. (See Section 56)

The foregoing reference to specific laws will not be deemed to be a limitation of obligation of the Contractor to perform his obligations in full compliance with the provisions and requirements of all federal and state statues and local ordinances applicable to the Work to be done under the contract.

It is agreed and understood that any contracts and/or orders placed as a result of this proposal will be governed and construed and the rights and obligations of the parties hereto will be determined in accordance with the laws of the State of New Jersey.

Upon completion of the Work, the Contractor will furnish a Certification of Compliance with the New Jersey Prevailing Wage Act. The certificate in a form acceptable to County Counsel is a condition of the final payment. (See form attached)

24. BRAND NAME OR EQUAL

When the Specifications, Forms, and other Contract Documents use “brand name or equivalent” or similar language, the listed brand name shall serve as a reference or point of comparison for the functional or operational characteristic desired for the goods or services being requested. Where a bidder attempts to submit an equivalent product for a brand name, it shall be the responsibility of the bidder to fully describe and document the product to be provided with the bid in order to establish the equivalence claim.

A. If the Bidder proposes to offer substitute goods as an equal to those specified herein, the bidder shall so indicate with the Bid Proposal. For the purposes of this paragraph, a proposed item shall be considered equal to goods specified herein if:

1. The County, in its sole discretion, determines that: (i) the goods conform substantially, even with deviations, to the brand name goods specified herein; (ii) the goods are equal to or greater than the brand name goods specified herein in terms of quality, durability, functionality,

appearance, strength and design; (iii) the goods are capable, at least as well as the brand name goods specified herein, or performing with existing equipment; and (iv) the goods do not cost the County more than the brand name goods specified herein costs the County.

B. To offer substitute goods as an equal to those specified herein, it is necessary that:

1. The Bidder submits sufficient information with its bid to permit the County to determine that the goods are equivalent to the brand name goods specified herein, including, but not necessarily limited to the brand, catalog number and specifications/data sheets;

2. The Bidder fully identifies and describes the variations of the goods from the brand name goods specified herein on a separate sheet that is to be submitted with the bid proposal. Bidder's literature WILL NOT suffice in explaining exceptions to these specifications.

3. The Bidder certifies that the goods (i) are similar in substance to the brand name goods specified, and (ii) are suited to the same use as the item specified;

C. The County shall be allowed a reasonable time within which to evaluate the Bidder's proposal to offer substitute goods as an equal to those specified herein. The County shall be the sole judge of acceptability. No "or-equal" goods shall be ordered, delivered, assembled, set-up or utilized until the County's evaluation is complete. The County's determination as to equivalency shall be deemed final and absolute.

In the event the Bidder does not provide sufficient supporting documentation with the bid, it will be presumed and required that the brand name goods and services as described in the specifications will be provided.

25. LINES AND GRADES

Normally, horizontal and vertical control points will be provided in the technical specifications. All other surveying will be the responsibility of the Contractor unless otherwise noted.

26. NUMBER OF WORKING DAYS

In accordance with N.J.S.A. 40A:11-17, the Work for the within Project shall be completed as specified on the Time of Completion Form. See form attached.

There shall be taken a deduction from the contract price, or any wages paid by the County, to any inspector(s) necessarily employed by it on the Work, for any number of days in excess of the number allowed in the specifications.

27. PROMPT PAYMENT OF CONSTRUCTION CONTRACTS (NJ Prompt Payment Act)

Pursuant to N.J.S.A. 2A:30A-1 et seq., payment to the Contractor, other than for Work done pursuant to a contact allowance, where applicable, shall be processed and paid as follows:

1. All contractor bills shall be either approved for payment, or notice provided as to why the bill or any portion of it will not be approved by the representative(s) of the governing body no later than the public meeting following 20 calendar days of the billing date as defined in the statute.

2. If the billing is approved, said bill shall be paid in the payment cycle following the meeting.

28. STOPPING WORK ON ACCOUNT OF BAD WEATHER

Work must only be performed in weather suitable for the type of construction planned or underway. Extremes in temperature, humidity, precipitation, evaporation, etc. can detrimentally affect the constructed product. Refer to the Standard and Technical Specifications for specific items.

29. ACCESS FOR OTHER CONTRACTORS

The Contractor for this Work will give proper access to other contractors who may be employed upon the Project and must not hinder or delay unnecessarily any Work that may be progressing under other contracts.

30. CONDEMNED MATERIALS AND WORK

Any materials and or part of the Work that may be condemned by the County Engineer will be removed and replaced by the Contractor or otherwise rectified, as may be directed by the County Engineer. No payment will be made upon the Work until such faulty work has been made good as may be directed. In the event the Contractor refuses or neglects to make good such faulty work, he will be deemed to have abandoned the contract and proceedings may be taken against him as provided herein.

31. STORAGE

In the event that it is necessary for the Contractor to stockpile or store materials or equipment on the job site, the Contractor shall inform the County of such necessity and the County may offer available space, if any, for storage of such materials or equipment. The Contractor shall use said space only for such purpose. Any and all materials which may be stored in such space or which may be brought onto the job site at any time by the Contractor will be at the Contractor's sole risk. The County will not be responsible for loss of or damage to said materials or equipment for any cause whatsoever. The Contractor shall take necessary measures to protect any such storage area and shall be responsible for any and all damages.

32. FINAL CLEAN UP

Upon completion of the Work, the Contractor will remove all equipment, unused materials, rubbish, etc., and will repair, or replace in an a manner acceptable to the County Engineer, all areas that may have been damaged in the prosecution of the Work. Same shall be a condition precedent to final payment. Should said Contractor fail to comply with this requirement, the County shall undertake the clean-up with its own forces and charge the cost of same against the Contractor's contract balance.

33. SUB-LETTING OF WORK

Except for the List of Subcontractors, pursuant to NJSA 40A:11-16 (See form attached), no portion of the Work will be sublet by the Contractor to any other entities, except with the consent of the County Engineer. A complete list of subcontractors must be submitted to the County Engineer at the preconstruction meeting. If the job does not warrant a preconstruction meeting, the Contractor must submit such list prior to the start of Work.

All Subcontractors will be subject to N.J.S.A. 34:11-56 et al.

N.J.S.A. 40A:11-16 requires the bidder to list in the bid sheets the name or names of all subcontractors involved in the following types of Work: plumbing and gas fitting and all kindred work, steam and hot water heating, ventilating apparatus, steam power plants and kindred work, electrical work, ornamental iron work, and structural steel. In addition, the County may require the identification of specific additional subcontractors. If these trades are expected to be part of the contract, such subcontractors should be listed on the "Subcontractor Identification Statement List of Subcontractors" and Bidder shall certify same on the accompanying sheet titled "Subcontractor Identification Certification". (See forms attached) **Bidder's failure to submit these two forms shall be considered a material defect and result in rejection of Bidder's bid.** Substitutions of any listed

subcontractors pursuant to N.J.S.A. 40A:11-16 will not be permitted except with the consent of the County Engineer.

34. SAFETY

The Contractor shall observe all rules and regulations of the Federal, State, and local health officials. Attention is directed to Federal, State, and local laws, rules, and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to the worker's health or safety.

The Contractor shall admit to the site, without delay and without the presentation of an inspection warrant, any inspector of OSHA or other legally responsible agency involved in safety and health administration upon presentation of proper credentials.

The Contractor shall make available to the Contractor's employees, subcontractors, the County Engineer, and the public, all information pursuant to OSHA 29 CFR Part 1926.59 of The Hazard Communication Standard 29 CFR 1910.1200, and shall also maintain a file on each job site containing all Material Safety Data Sheets (MSDS) for products in use at the Project. These Material Safety Data Sheets shall be made available to the Engineer upon request.

The Contractor shall at all times conduct the Work to provide for the safety and convenience of the general public and protection of persons and property. The safety provisions of applicable laws, OSHA regulations, building and construction codes, and the rules and regulations of the New Jersey Department of Labor and Workforce Development and Commerce shall be observed.

35. QUALITY, SAFETY AND PERFORMANCE STANDARDS

All goods and services must be constructed and provided with the highest quality materials and workmanship. It is the intent of these specifications that only equipment equal to, or exceeding, the standard specified will be acceptable in order to protect the safety of the occupants of the Building.

36. MATTERS NOT MENTIONED IN CONTRACT DOCUMENTS

Any Work, material, or method, not specifically described in these specifications, but shown upon the plans of the Work, will be carried out as shown on said plan.

37. PERMITS

The Contractor will obtain all necessary permits required by law and provide the County with necessary approvals prior to commencement of permitted Work.

38. CONTRACTOR TO PROVIDE PROOF OF PAYMENT

Upon the completion of the Work, the Contractor will furnish a General Release as proof that all claims for labor, materials, etc., have been settled by the Contractor. The General Release, in a form acceptable to County Counsel, is a condition of final payment.

39. CHANGE ORDERS

Change Order Procedures shall comply with N.J.A.C. 5:30-11.1 et seq., "Change Orders and Open End Contracts" and subsequent provisions of the New Jersey Administrative Code.

40. SUPPLEMENTAL WORK

In case any supplemental work is necessary, it will be performed by the Contractor at a price fixed by agreement between the Contractor and the County Engineer and approved by the County as specified in Section 38. The Contractor will do no supplemental work on any character, for which the Contractor will demand pay, except upon the written order of the County.

41. FORM OF CONTRACT

Contracts will be let on the attached Form of Agreement Between County ("Owner") and Contractor (AIA 101), and General Conditions (AIA 201), as supplemented.

The Contract will be subject to all statutory provisions on the matter of Public Works, Public Contracts, The Law Against Discrimination, the Laws Governing Affirmative Action and Prevailing Rates of Wages under the laws of New Jersey.

The Agreements shall be executed by both parties not later than twenty-one (21) days from the date of the award by the County (Sundays and holidays excluded); however, such time frame may be extended by agreement of the parties.

42. PROGRESS PAYMENTS

Monthly progress payments will be made based on the value of labor and materials incorporated in the Work and of materials suitably stored at the site. An itemized schedule of values shall be submitted with each Application for Payment.

(Refer to the Owner/Contractor Agreement for Retainage and other conditions pertaining to payment and the application of N.J.S.A. 2A:30A-1 et seq.)

All Applications for Payment shall be accompanied by paid invoices for materials incorporated in the Work and for materials suitably stored at the site, and affidavit(s) by

Subcontractors whose Work was included in the next to the last application to the effect such Work and such materials have been paid for.

No payment shall be made without Contractor having provided all submittals set forth in this Section, and the approval of same by the County.

For contracts exceeding $100,000.00, monthly payments will be made on the Work to the extent of 98% of the value of the Work done which is considered to be retainage.

For contracts less than $100,000.00, monthly payments will be on the Work to the extent of 90% of the value of the Work done. In lieu of the retainage, the Contractor will, at his option, deposit with the County Counsel negotiable bearer bonds of the State of New Jersey or any political subdivision thereof, equal to the amount otherwise withheld as retainage.

When the Project is completed, the final cost of the Project will be based on actual quantities of authorized Work done under each item scheduled in the bidding sheet and approved Change Orders, if any. The money due to the Contractor as determined by said final certificate after deduction of previous monthly payments on account, will be paid to the Contractor in accordance with the terms of the contract dealing with Prompt Payment, providing, however that before such final payment is made, all outstanding claims against the Contractor must be satisfied. Before final payment is released, the Contractor must furnish: a**)** Maintenance Bond (see Section 17 of these general specifications); **b)** Certification of Compliance, New Jersey Prevailing Wage Act (see Sections 23 & 51); and **c)** General Release (see Section 38) in a form satisfactory to County Counsel; **d)** complete set of as-built plans in the latest AutoCad on compact disc; and e) a complete set of in-progress photos in jpg, jpeg, or bmp digital format on a compact disc.

43. INSPECTION

The Work must be done in accordance with the plans and specifications, and will be inspected by the County Engineer. An inspector may be placed upon the Work at any time by the County Engineer to see that the plans, specifications, and instructions of the County Engineer are carried out. In connection herewith, bidders are referred to N.J.S.A. 40A:11-17.

44. DAMAGES

The Contractor will be held responsible for all damages that may occur to Work, or to persons or property by reason of the nature of the Work or from the elements, or by reason of inadequate protection of the Work, or from any carelessness or negligence on his part or on the part of his employees. The County will withhold payments on the Work until all suits or claims for damages sustained on, or by reason of, this Work will have been settled by the Contractor.

The construction and final completion of this Work will be guaranteed by the Contractor. Any damages that may be done to the Work or any part thereof, by the elements or otherwise, during its construction, will be made good by the Contractor.

45. LIQUIDATED DAMAGES

If the Project is not completed within the time specified herein or within such further time as may have been granted by the County Engineer, then the Contractor hereby agrees to pay to the County as liquidated damages, but not as a penalty, $1,000.00 per day for each and every calendar day that he is in default on time to complete the Work. The said sum will be deducted from moneys due the Contractor and if the damages exceed this amount, then the Contractor or his Surety Company will pay the excess. These damages may be waived at the option of the County.

46. AFFIRMATIVE ACTION REQUIREMENTS

EXHIBIT B
(Revised 4/10)

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. l7:27-7.2; provided,

however, that the Division may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B and C, as long as the Division is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Division, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. l7:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

(l) To notify the public agency compliance officer, the Division, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contactor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Division. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Division, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Division.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Division and submitted promptly to the Division upon request.

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce

for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Division an initial project workforce report (Form AA 201) electronically provided to the public agency by the Division, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Division and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Division of Public Contracts Equal Employment Opportunity Compliance as may be requested by the Division from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Public Contracts Equal Employment Opportunity Compliance for conducting a compliance investigation pursuant to **Subchapter l0 of the Administrative Code (NJAC 17:27).**

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

47. INVESTMENT ACTIVITIES WITH IRAN

Pursuant to P.L. 2012, c.25, codified as N.J.S.A. 52:32-55 et seq., prohibits State and local public contracts with persons or entities engaging in certain investment activities in energy or finance sectors of Iran.

48. COMPLIANCE WITH THE PUBLIC WORKS CONTRACTOR REGISTRATION ACT - (N.J.S.A. 34:11-56.48 et seq.)

Pursuant to the above-referenced law, Bidders are required to be registered with the New Jersey Department of Labor and Workforce Development and to possess a current certificate by said Department indicating compliance with the Act prior to the time and date that bids are received. Bidders are notified of this requirement of their compliance. Such certificates or applications shall also be provided for each Subcontractor furnishing plumbing and gas fitting, steam and hot water heating and ventilating apparatus, and all kindred work, steam power plants and kindred work, electrical work, structural steel and ornamental iron work, and such other subcontractors as the specifications require relative to prior identification.

49. UTILITIES

Attention of the bidder is directed to the fact that the approximate locations of known utility structures and facilities that may be encountered within and adjacent to the limits of the Work are shown on the plans and described herein. The accuracy and completeness of this information is not guaranteed by the County Engineer and the bidder is advised to ascertain for himself all the facts concerning the location of these and other utilities.

The Contractor will not proceed with his Work until he has made diligent inquiries of all public utility and municipal officials to determine the exact location of all-underground structures and pipes within the site of the Project. The Contractor will notify utility owners not less than ten (10) days in advance of the time he proposes to perform any Work that will endanger or affect their facilities in compliance with **New Jersey One-Call.** In excavating in any part of the Work, care must be taken not to remove or damage any gas, water, sewer, or other pipe, conduit, or structure, - public or private - without the concurrence of the owner and the County Engineer. The Contractor will, at his own expense, shore up, secure and maintain a continuous flow in such structures, and will keep them in repair until final acceptance of the Work.

When pipes or other structures are encountered or when the removal, relocation or protection of these utilities are necessary in carrying out the Project as planned, the Contractor will cooperate with the owner of said utilities and will permit the owners or their agents access to the site of the Work in order to relocate or protect their facilities and not hinder or delay unnecessarily the Work of the owners in moving same. No extra allowance of payment will be made to the Contractor for the use of any materials, equipment, etc.,

or for the performance of any Work in connection with the moving of said structures unless the Contractor is specifically ordered by the County Engineer to furnish such materials, equipment, or services. If directed by the County Engineer to do any Work or furnish any materials or equipment, payment will be allowed the Contractor in accordance with the unit prices bid for such Work, or, if such items are not scheduled in the proposal, such Work shall be allowed "Supplemental Work" as provided in Section 39 of these general specifications. The corporations, companies, agencies or municipalities owning or controlling the utilities, and the name, and telephone numbers are listed in the beginning of the Technical Specifications.

50. MATERIAL COMPLIANCE AND SHOP DRAWINGS

The Contractor will require the manufacturer or supplier to furnish three (3) copies of Certification of Compliance with each delivery of materials, components and manufactured items for the Project. Two (2) copies will be furnished to the County Engineer; one copy will be retained by the Contractor. Certificates of Compliance will contain the following information:

1. Project to which material is consigned;
2. Name of the Contractor to which the material is supplied;
3. Kind of material supplied;
4. Quantity of material represented by the Certificate;
5. Means of identifying the consignment, such as label marking, seal number, etc.;
6. Date and method of shipment;
7. That the material is in conformity with the pertinent specifications stated in the certificate; and
8. Signature of a person having legal authority to bind the supplier.

The Contractor will submit to the County Engineer for his approval five (5) copies of complete and fully detailed shop or working drawings for those items listed in the beginning of the technical specifications.

Each drawing will identify the name of the job, location and Contractor.

All drawings will be approved in accordance with the standard specifications. Refer to the Technical Specifications for specific items.

All materials or articles used in the Work will be of American manufacture, insofar as same are available, in conformance with N.J.S.A. 40A:11-18.

51. PRECONSTRUCTION

In order to provide full coordination of this Project among the parties concerned, the County Engineer will arrange for a preconstruction meeting between the Contractor, County Engineer and other interested parties as soon as possible after the contract is

executed. At this meeting the Contractor will present his proposed schedule of Work which shall be subject to review and approval of the County through its designated representatives.

52. DISPUTES UNDER THE CONTRACT

A dispute arising under the Contract shall be submitted in writing to the County Engineer with all facts and supporting data. The County Engineer will review the dispute and issue his decision or request additional facts or documentation after which he will render his decision.

In the event the dispute is not then resolved, the matter shall, pursuant to law, be submitted to mediation before being submitted to a court of competent jurisdiction venued in Union County.

The County Engineer will notify the County Counsel when a matter is to be submitted to mediation. The County Counsel will communicate with the parties and inform them of the procedures to be followed in making such a submission.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

53. ORDINANCE NO. 557-2002 ADOPTED ON SEPTEMBER 5, 2002 BY THE BOARD OF COUNTY COMMISSIONERS

Ordinance No. 557-2002 adopted on September 5, 2002 by the Board of County Commissions on Preclassification of Bidders by the NJDPMC **(if applicable)** pursuant to Ordinance No. 557-2002, the County of Union requires all bidders on projects for the construction, reconstruction, demolition, alteration, repair or maintenance of public buildings to be preclassified by the State of New Jersey, Department of Treasury, Division of Property Management and Construction ("DPMC").

Bidders must provide proof of classification in the form of a Certificate/Notice of Classification from the DPMC showing a sufficient aggregate rating to cover their bid amount, which is active on the date of receipt of these bids. Further, Bidder must also provide proof of preclassification in the applicable/appropriate trade code necessary for Work on the Project.

AN ORDINANCE IN ACCORDANCE WITH N.J.S.A. 40A:11-25 ESTABLISHING REASONABLE REGULATIONS APPROPRIATE FOR CONTROLLING THE QUALIFICATIONS OF PROSPECTIVE BIDDERS UPON CONTRACTS TO BE AWARDED ON BEHALF OF THE CONTRACTING UNIT, BY THE CLASS OR CATEGORY OF GOODS AND SERVICES TO BE PROVIDED OR PERFORMED AND FIXING THE QUALIFICATIONS REQUIRED ACCORDING TO THE FINANCIAL ABILITY AND EXPERIENCE OF THE BIDDERS AND THE CAPITAL AND EQUIPMENT AVAILABLE TO THEM PERTINENT TO AND REASONABLY RELATED TO THE CLASS AND CATEGORY OF SERVICE TO BE PERFORMED IN THE PERFORMANCE OF ANY SUCH CONTRACT.

WHEREAS, N.J.S.A. 40A:11-25 provides that the governing body of any contracting unit may establish reasonable regulations appropriate for controlling the qualifications of prospective bidders upon contracts to be awarded on behalf of the contracting unit, by the class or category of goods and services to be provided or performed; and

WHEREAS, N.J.S.A. 40A:11-25 also states that the regulations established by the governing body may fix the qualifications required according to the financial ability and experience of the bidders and the capital and equipment available to them pertinent to and reasonably related to the class and category of service to be performed in the performance of any such contract; and

WHEREAS, N.J.S.A. 40A:11-25 also requires that prior to the adoption of any such regulations, a contracting unit shall submit them to a public hearing and notice and a general description of the subject matter shall be published in not less than two newspapers; and

WHEREAS, N.J.S.A. 52:35-1 et seq. and 18A:18A-27 et seq. establish qualifications for the experience and financial abilities of bidders and the capital and equipment available to them relative to the specific services to be performed; and

WHEREAS, currently state officials, under the Department of Treasury, Division of Property Management and Construction, classify all prospective bidders as to the character and amount of public works on which they shall be qualified to submit bids and bids shall be accepted only from persons qualified in accordance with such classifications; and

WHEREAS, application for classification is open to all Contractors, regardless of the size of the business; and

WHEREAS, classification is based on general standards equally applicable to all Contractors; and

WHEREAS, classification is expressed in terms of trade and an aggregate rating determined on the basis of experience, financial ability, equipment and capital; and

WHEREAS, generally aggregate ratings can range from 0 to $200,000.00; and

WHEREAS, the County of Union will determine the aggregate rating it will require on contracts depending on the size and expense of the Project, but at no time shall the required aggregate rating exceed $25,000,000.00 for any one project; and

WHEREAS*,* such provisions are of considerable benefit to the County and to bidders by insuring that such bidders have the requisite experience, expertise and resources necessary to effectively perform the terms and conditions of the contract:

BE IT ORDAINED by the Board of County Commissioners of the County of Union that it formally adopts as **Policy** that all prospective bidders for building construction projects be classified in accordance with the Department of Treasury – Division of Property Management and Construction pursuant to N.J.S.A. 52:35-1 *et seq*. and N.J.S.A. 18A:18A-27 *et seq*.

BE IT FURTHER ORDAINED that the Board of County Commissioners of the County of Union hereby adopts the classification of bidders by the New Jersey Department of Treasury, Division of Property Management and Construction as a reasonable regulation for controlling the qualifications of prospective bidders upon contracts to be awarded for construction on behalf of the County of Union.

BE IT FURTHER ORDAINED that the provisions of this ordinance are severable. To the extent any clause, phrase, sentence, paragraph or provision of this ordinance shall be declared invalid, illegal or unconstitutional, the remaining provisions shall continue to be in full force and effect.

BE IT FURTHER ORDAINED that a public hearing shall be held on this ordinance on September 5, 2002 at the meeting of the Board of County Commissioners, County Administration Building, Elizabeth, New Jersey.

BE IT FURTHER ORDAINED that the Clerk of the Board of County Commissioners of the County is hereby directed to publish and post notice of this ordinance as required by law.

BE IT FURTHER ORDAINED that within 10 days hereof the Clerk of the Board of County Commissioners of the County shall forward certified copies of this ordinance to the County Manager, Director of Finance, County Counsel, and Division of Local Government Services.

This ordinance shall take effect twenty (20) days after final adoption and publication in accordance with applicable law.

54. CONTRACTOR BUSINESS REGISTRATION CERTIFICATE

New Mandatory Requirement -Effective 1/18/2010

The recently enacted **P.L. 2009, c.315**, requires that effective January 18, 2010; a contracting agency must receive proof of the bidder's business registration prior to the award of a contract. However, the proof must show that the bidder was in fact registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

If subcontractors are named on the bid, proof of the business registration for each subcontractor must be provided prior to the award of bid. Similarly to the bidder, the proof must show that each subcontractor was registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

Proof of business registration shall be

- A copy of a Business Registration Certificate issued by the Department of the Treasury, Division of Revenue; or
- A copy of the web version provided by the NJ Division of Revenue, or

Register online at http://www.state.nj.us/treasury/revenue/busregcert.htm. Click the "online" link and then select "Register for Tax and Employer Purposes or call the Division at 609-292-1730.

Note: A NJ Certificate of Authority is <u>not</u> acceptable.

FAILURE to submit proof of registration of the bidder or any subcontractor named on the bid prior to the award of contract shall be cause to reject the bid.

FAILURE of the bidder or any subcontractor named on the bid to be <u>registered</u> prior to the receipt of bids is cause for a **MANDATORY REJECTION** of bids. (A NON-WAIVABLE DEFECT). This covers construction Work as well as non-construction bids.

IN ADDITION:

N.J.S.A. 52:32-44 imposes the following requirements on Contractors and all subcontractors that knowingly provide goods or perform services for a Contractor fulfilling this contract:

1) the Contractor shall provide written notice to its subcontractors and suppliers to submit proof of business registration to the Contractor;
2) subcontractors through all tiers of a project must provide written notice to their subcontractors and suppliers to submit proof of business registration and subcontractors shall collect such proofs of business registration and maintain them on file;

3) prior to receipt of final payment from a contracting agency, the Contractor must submit to the contacting agency an accurate list of all subcontractors and suppliers or attest that none was used; and,

4) during the term of this contract, the Contractor and its affiliates shall collect and remit, and shall notify all subcontractors and their affiliates that they must collect and remit, to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act, (*N.J.S.A*. 54:32B-1 *et seq*.) on all sales of tangible personal property delivered into this State.

A Contractor, subcontractor or supplier who fails to provide proof of business registration or provides false business registration information shall be liable to a penalty of $25 for each day of violation, not to exceed $50,000 for each business registration copy not properly provided or maintained under a contract with a contracting agency. Information on the law and its requirements are available by calling (609) 292-9292.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

55. PROJECT LABOR AGREEMENT (To be signed where the overall project cost exceeds $5 Million, irrespective of Phasing)

An Executive Order of Governor James E. McGreevey dated January 17, 2002, requires the use of a Project Labor Agreement in public construction contracts. This Executive Order was codified as N.J.S.A. 52:38-1 et seq. as a result of P.L. 2002, Chapter 44. Contractor must be prepared to abide by the terms of the within Project Labor Agreement, including obtaining the necessary and applicable Letters of Assent from subcontractors (of any tier). Through said Letters of Assent the subcontractors (of any tier) also must be prepared to abide by the terms of the Project Labor Agreement.

Contractor's failure to enter into this Project Labor Agreement shall result in the County's valid refusal to enter into a contract, for the performance of the Work with Contractor and shall constitute a default under the Contract. In addition, Contractor will be required to submit the completed Letters of Assent to the County with the executed Project Labor Agreement. The Project Labor Agreement is to be executed only where the total Project cost is $5 Million or more, irrespective of Phasing.

ARTICLE 1 - PREAMBLE

WHEREAS, the COUNTY OF UNION, on behalf of itself, and Project Management Firms ("PMF") acting as Construction Managers, and reflecting the objectives of the COUNTY OF UNION ("UC"), as Owner, desires to provide for the efficient, safe, quality, and timely completion of a construction project for the County in a manner designed to afford lower reasonable costs to Union County, the Union County Freeholder Board, and the Public it represents, and the advancement of public policy objectives; **(See Project Labor Agreement attached)**

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia by:

(1) ensuring a reliable source of skilled and experienced labor;
(2) standardizing the terms and conditions governing the employment of labor on the Project;
(3) permitting wide flexibility in Work scheduling and shift hours and times; from those which otherwise might obtain;
(4) receiving negotiated adjustments as to Work rules and staffing requirements from those which otherwise might obtain;
(5) providing comprehensive and standardized mechanisms for the settlement of Work disputes, including those relating to jurisdiction;
(6) avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from Work disputes, and promote labor harmony and peace for the duration of the Projects.

(7) furthering public policy objectives as to improved employment opportunities for minorities, women and the economically disadvantaged in the construction industry;
(8) expediting the construction process; and,

WHEREAS, the signatory Unions desire the stability, security and Work opportunities afforded by a Project Labor Agreement; and

WHEREAS, the Parties desire to maximize Project safety conditions for both workers and the public,

NOW, THEREFORE, the Parties enter into this Agreement:

SECTION 1. PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by and between UC and its successors and assigns, General Contractors to be named, for certain construction Work to be performed on construction performed pursuant to the “Local Public Contracts Law” in the State of New Jersey and by the Union County Building and Construction Trades Council, AFL-CIO, on behalf of itself and its affiliates and members.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1. DEFINITIONS

Throughout this Agreement, the Union party and the Building Trades Council are referred to singularly and collectively as "the Union(s)" where specific reference is made to "Local Unions" that phrase is sometimes used; the term "Contractor(s)" shall include the Project Management Firm and all signatory Contractors, and their subcontractors of whatever tier, engaged in on-site Project construction Work within the scope of this Agreement as defined in Article 3; County of Union (UC) is referenced as (Owner); the Union County Building and Construction Trades Council, AFL-CIO is referenced as the BTC, and the Work covered by this Agreement (as defined in Article 3) is referred to as the "Project".

SECTION 2. CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

The Agreement shall not become effective unless executed by the BTC, the PMF, and the General Contractor and will remain in effect until the **final** completion of the **Project.**

SECTION 3. ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all signatory Unions and the Project

Management Firms and all signatory Contractors performing on-site Project Work, including site preparation and staging areas, as defined in Article 3. The Contractors shall include in any subcontract that they let, for performance during the term of this Agreement, a requirement that their subcontractors, of whatever tier, become signatory and bound by this Agreement with respect to subcontracted Work performed within the scope of Article 3. This Agreement shall be administered by the PMF on behalf of all Contractors.

SECTION 4. SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto as Schedule A represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other collective bargaining agreement of any type which would otherwise apply to this Project, in whole or in part. Where a subject covered by the provisions, explicit or implicit, of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall prevail. It is further understood that neither the PMF nor any Contractor shall be required to sign any other agreement as a condition of performing Work on this Project. No practice, understanding or agreement between a Contractor and Local Union, which is not explicitly set forth in this Agreement shall be binding on this Project unless endorsed in writing by the PMF.

SECTION 5. LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The PMF and any Contractor shall not be liable for any violations of this Agreement by any other Contractor and the BTC and Local Unions shall not be liable for any violations of this Agreement by any other Union.

SECTION 6. THE CONSTRUCTION PROJECT MANAGER

UC shall require in its bid specifications for all Work within the scope of Article 3 that all successful bidders, and their subcontractors of whatever tier, become bound by, and signatory to, this Agreement. UC is not a party to and shall not be liable in any manner under this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of UC in determining which Contractors shall be awarded contracts for Project Work. It is further understood that UC has sole discretion at any time to terminate, delay or suspend the Work, in whole or part, on this Project.

SECTION 7. AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Unions agree that this Agreement will be made available to, and will fully apply to any successful bidder for Project Work who becomes signatory thereto, without regard to whether that successful bidder performs Work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder are, or

are not, members of any unions. This Agreement shall not apply to the Work of any Contractor or PMF, which is performed at any location other than the Project site, as defined in Article 3, Section 1.

ARTICLE 3 - SCOPE OF THE AGREEMENT

The Project Work covered by this Agreement shall be as defined and limited by the following sections of this Article.

SECTION 1: THE WORK

This Agreement shall apply to building construction conducted by the County of Union pursuant to the "Local Public Contracts Law" in the State of New Jersey**.** This scope of Work may be amended time to time by UC to include Work not performed under the "Local Public Contracts Law".

The scope of Work is confined to the on-site Project Work contained in the scope of the General Contractor's final construction contract.

SECTION 2. EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing Work on the Project:

Superintendents, supervisors (excluding superintendents and general supervisors and forepersons specifically covered by a craft's Schedule A), engineers, inspectors and testers (excluding divers specifically covered by a craft's Schedule A), quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, non-manual employees, and all professional, engineering, administrative and management persons;

Employees of UC or any State agency, authority or entity or employees of any municipality or county or other public employer;

Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery, unless such offsite operations are covered by the New Jersey Prevailing Wage Act by being dedicated exclusively to the performance of the public works contract or building project and are adjacent to the site of Work, or involved in deliveries to and from the Project site, excepting local deliveries of all major construction materials including fill, ready mix, asphalt and item 4 which are covered by this Agreement.

Employees of the PMF or General Contractor, excepting those performing manual, on-site construction labor who will be covered by this Agreement;

Employees engaged in on-site equipment warranty.

Employees engaged in geophysical testing (whether land or water) other than boring for core samples;

Employees engaged in laboratory or specialty testing or inspections;

Employees engaged in ancillary Project Work performed by third parties such as electric utilities, gas utilities, telephone utility companies, and railroads.

SECTION 3. NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to the parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractor or of PMF, which do not perform Work at this Project. It is agreed, for the purposes of this Agreement only, that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the owners, the PMF and/or any Contractor. The Agreement shall further not apply to UC or any other state or county agency, authority, or other municipal or public entity and nothing contained herein shall be construed to prohibit or restrict UC or its employees of any other state authority, agency or entity and its employees from performing on or off-site Work related to the Project. As the contracts which comprise the Project Work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty Work are assigned in writing (copy to Local Union involved) by the General Contractor for performance under the terms of this Agreement.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 1. PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all craft employees who are performing on-site Project Work within the scope of this Agreement as defined in Article 3.

SECTION 2. UNION REFERRAL

A. The Contractors agree to hire Project, craft employees covered by this Agreement through the job referral systems and hiring halls (where the referrals meet the qualifications set forth in items 1,2, and 4 subparagraph B) established in the Local Unions' area collective bargaining agreements (attached as Schedule A to this Agreement).

Notwithstanding this, the Contractors shall have sole rights to determine the competency of all referrals; the number of employees required (except with regard to pile driving); the selection of employees to be laid-off (subject to the applicable procedures in Schedule A for permanent and/or temporary

layoffs and except as provided in Article 5, Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments required in the applicable Schedule A. In the event that a Local Union is unable to fill any request for qualified employees within a 48-hour period after such requisition is made by the Contractor (Saturdays, Sundays, and holidays excepted), the Contractor may employ qualified applicants from another competent source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of the Project, craft employees hired within its jurisdiction from any source other than referral by the Union.

B. A Contractor may request by name, and the Local will honor, referral of persons who have applied to the Local for Project Work and who meet the following qualifications as determined by a Committee of 3 designated, respectively, by the applicable Local Union, the PMF and a mutually selected third party or, in the absence of agreement, the permanent arbitrator (or designee) designated in Article 7:

(1) possess any license required by NJ law for Project Work to be performed;
(2) have worked a total of at least 1000 hours in the Construction craft during the prior 3 years;
(3) were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award;
(4) have demonstrated ability to safely perform the basic function of the applicable trade.

No more than 12 per centum of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above (any fraction shall be rounded to the next highest whole number).

C. A certified MBE/WBE contractor may request from the Workforce Coordinator, through the PMF, an exception to, and waiver of, the above per centum limitation upon the number of its employees to be hired through the special provision of Section2.B above. This exception is based upon hardship and demonstration by the contractor that the Project Work would be the contractor’s only job and that it would be obliged to lay off qualified minority and female employees in its current workforce moving from the last job.

The exception and waiver are also conditioned upon the employees meeting the qualifications as set forth in Section 2.B above.

SECTION 3. NON-DISCRIMINATION IN REFERRALS

The Unions represent that their hiring halls and referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations, which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4. MINORITY AND FEMALE REFERRALS

In the event a Union either fails, or is unable, to refer qualified minority or female applicants in percentages equaling Project affirmative action goals as set forth in UC's bid specifications, the Contractor may employ qualified minority or female applicants from any other available source as Apprentice Equivalents. Apprentice Equivalents will have completed a DOL approved training program, applied to take a construction Apprenticeship test, and will be paid at not less then the applicable equivalent Apprentice rate. With the approval of the Local Administrative Committee (LAC), experience in construction related areas may be accepted as meeting the above requirements.

SECTION 5. CROSS AND QUALIFIED REFERRALS

The Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified craft employees to fulfill the requirements of the Contractor.

SECTION 6. UNION DUES / WORKING ASSESSMENTS

All employees covered by this Agreement shall be subject to the union security provisions contained in the applicable Schedule A local agreements, as amended from time to time, but only for the period of time during which they are performing on-site Project Work and only to the extent of rendering payment of the applicable union dues and assessments uniformly required for union membership in the Local Union, signatory to this Agreement, which represents the craft in which the employee is performing Project Work. No employee shall be discriminated against at the Project site because of the employee's union membership or lack thereof. In the case of unaffiliated employees, the dues payment can be received by the Unions as a working assessment fee.

SECTION 7. CRAFT FOREPERSONS AND GENERAL FOREPERSONS

The selection of craft forepersons and/or general forepersons and the number of

forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule A. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft foreperson shall be designated as working forepersons at the request of the Contractor, except when an existing local Collective Bargaining Agreement prohibits a foreperson from working when the craftsperson he is leading exceed a specified number.

ARTICLE 5 - UNION REPRESENTATION

SECTION 1. LOCAL UNION REPRESENTATIVE

Each Local Union representing on-site Project employees shall be entitled to designate, in writing (copy to General Contractor involved and the PMF), one representative, and the Business Manager, who shall be afforded access to the Project.

SECTION 2. STEWARDS

A. Each Local Union shall have the right to designate a working journey person as a Steward and an alternate, and shall notify the Contractor and PMF of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. There will be no non-working Stewards on the Project.

B. In addition to their Work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's Contractor and, if applicable, subcontractors of that Contractor, but not with the employees of any other Contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.

B. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime, except pursuant to a Schedule A provision providing procedures for the equitable distribution of overtime.

SECTION 3. LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union, 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the Work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 - MANAGEMENT'S RIGHTS

SECTION 1. RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their Project operations including, but not limited to: the right to direct the work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; or the discipline or discharge for just cause of its employees; the assignment and schedule of Work; the promulgation of reasonable Project Work rules; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices, which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, GC or PMF, and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2. MATERIALS, METHODS & EQUIPMENT

There shall be no limitations or restriction upon the Contractors' choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials, tool, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such Work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-out or testing of specialized or unusual equipment or facilities as designated by the Contractor. Notwithstanding the foregoing statement of Contractor rights, prefabrication issues relating to work traditionally performed at the job site shall be governed pursuant to the terms of the applicable Schedule A. There shall be no restrictions as to Work, which is performed off-site for the Project, except for work done in a fabrication center, tool yard, or batch plant dedicated exclusively to the performance of Work on the Project, and located adjacent to the “site of Work”.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 1. NO STRIKES-NO LOCKOUT

There shall not be strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Project for any reason by any Union or employee against any Contractor or employer while performing Work at the Project. There shall be no other Union, or concerted or employee activity which disrupts or interferes with the operation of the existing free flow of traffic in the project area. Failure of any Union or employee to cross any picket line established by

any union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to the Project site is a violation of this Article. There shall be no lockout at the Project by any signatory Contractor. Contractors and Unions shall take all steps necessary to ensure compliance with this Section 1 and to ensure uninterrupted construction and the free flow of traffic in the project area for the duration of this Agreement.

SECTION 2. DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 1 above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3. NOTIFICATION

If a Contractor contends that any Union has violated this Article, it will notify the appropriate district or area council of the Local Union involved advising of such fact, with copies of the notification to the Local Union and the BTC. The district or area council, and the BTC shall each instruct, order and otherwise use their best efforts to cause the employees, and/or the Local Unions to immediately cease and desist from any violation of this Article. A district or area council, or the BTC complying with these obligations shall not be liable for the unauthorized acts of a Local Union or its members.

SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

A. A party invoking this procedure shall notify J.J. Pierson who shall serve as Arbitrator under this expedited arbitration procedure. Copies of such notification will be simultaneously sent to the alleged violator and, if a Local Union is alleged to be in violation, it's International, UC, the PMF, the BTC, and the GC.

B. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the GC, the Local Union involved, the BTC, and the PMF, hold a hearing within 48 hours of receipt of the notice invoking the procedure it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice to the district or area council required by Section 3 above.

C. All notices pursuant to this Article may be by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the arbitrator, Contractor or Union involved. The hearing may be held on any day including Saturdays

or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for court proceedings, if any. The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

E. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of the Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved. In any court proceeding to obtain a temporary or preliminary order enforcing the arbitrator's Award as issued under this expedited procedure, the involved Union and Contractor waive their right to a hearing and agree that such proceedings may be ex parte, provided notice is given to opposing counsel. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

F. Any rights created by statue or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

G. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8. - LOCAL ADMINISTRATIVE COMMITTEE (LAC)

SECTION 1. THE LOCAL ADMINISTRATIVE COMMITTEE WILL MEET ON A REGULAR BASIS TO:

(1) Implement and oversee the Agreement procedures and initiatives;
(2) Monitor the effectiveness of the Agreement; and
(3) Identify opportunities to improve efficiency and Work execution.

SECTION 2. COMPOSITION

The LAC will be co-chaired by the President of the Building and Construction Trades Council or his designee, and designated official of UC. It will be comprised of representatives of the local unions signatory to the project labor agreement (PLA) and representatives of the PMF and other contractors on the Project.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

Step 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the Work site representative of the involved Contractor. To be timely, such notice of the grievance must be given within 7 calendar days after the act, occurrence, or event giving rise to the grievance, or after the act, occurrence or event became known or should have become known to the Union. The business representative of the Local Union or the job steward and the Work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 7 calendar days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor and the General Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, the provisions of the Agreement alleged to have been violated. Grievances and disputes

settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved, unless the settlement is accepted in writing, by the General Contractor, as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

The Business Manager or designee of the involved Local Union, together with representatives of the BTC, the involved Contractor, and the General Contractor shall meet in Step 2 within 5 calendar days of the written grievance to arrive at a satisfactory settlement.

Step 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 14 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to J.J. Pierson, who shall act as the Arbitrator under this procedure. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitration's shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the PMF, involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2. LIMITATION AS TO RETROACTIVITY

No arbitration decision or award may provide retroactivity of any kind exceeding 30 calendar days prior to the date of service of the written grievance on the construction Project Manager and the involved Contractor or Local Union.

SECTION 3. PARTICIPATION BY GENERAL CONTRACTOR

The General Contractor shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these Steps, including Step 3 arbitration.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1. NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the Work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2. ASSIGNMENT

A. There shall be a mandatory pre-job markup/assignment meeting prior to the commencement of any Work. Attending such meeting shall be designated representatives of the Union signatories to this Agreement, the PMF, and the involved Contractors. Best efforts will be made to schedule the pre-job meeting in a timely manner after Notice to Proceed is issued but not later then 30 days prior to the start of the Project.

C. All Project construction Work assignments shall be made by the Contractor according to the area practice.

SECTION 3. PROCEDURE FOR SETTLEMENT OF LABOR DISPUTES

A. Any Union having a jurisdictional dispute with respect to Project Work assigned to another Union will submit the dispute in writing to the Administrator, Plan for the Settlement of Jurisdictional Disputes in the Construction Industry ("the Plan") within 72 hours and send a copy of the letter to the other Union involved, the Contractor involved, the General Contractor, the BTC, and the district or area councils of the unions involved. Upon receipt of a dispute letter from any union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Plan.

B. Within 5 calendar days of receipt of the dispute letter, there shall be meeting of the General Contractor, the Contractor involved, the Local Unions involved and designees of the BTC and the district or area councils of the Local Unions involved for the purpose of resolving the jurisdictional dispute.

C. In order to expedite the resolution of jurisdictional disputes, the parties have agreed in advance to select Plan Arbitrator Pierson to hear all unsolved jurisdictional disputes arising under this Agreement. All other rules and procedures of the Plan shall be followed. If Plan Arbitrator Pierson is not available to hear the dispute within the time limits of the Plan, the Plan's arbitrator selection process shall be utilized to select another arbitrator. In the event that a union involved in the dispute is not a member of the BTC, the dispute shall be submitted directly to Arbitrator Pierson.

D. The Arbitrator will render a short-form decision within 5 days of the hearing based upon the evidence submitted at the hearing, with a written decision to follow within 30 days of the close of hearing.

E. This Jurisdictional Dispute Resolution Procedure will only apply to Work performed by Local Unions at the Project.

F. Any Local Union involved in a jurisdictional dispute on this Project shall continue working in accordance with Section 2 above and without disruption of any kind.

SECTION 4. AWARD

Any jurisdictional award pursuant to Section 3 shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in any court of competent jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement. In all disputes under this Article, the General Contractor and the involved Contractors shall be considered parties in interest.

SECTION 5. LIMITATIONS

The Jurisdictional Dispute Arbitrator shall have no authority to assign Work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the Work involved; nor to assign Work to employees who are not qualified to perform the Work involved; not to assign Work being performed by non-union employees

to union employees. This does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than 1 employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed Work belongs.

SECTION 6. NO INTERFERENCE WITH WORK

There shall be no interference or interruption of any kind with the Work of the Project while any jurisdictional dispute is being resolved. The Work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1. CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the Work performed and paid the base hourly wage rates for those classifications as specified in the attached Schedules A, as amended during this Agreement. Recognizing, however, that special conditions may exist or occur on the Project, the parties, by mutual agreement may establish rates and/or hours for one or more classifications, which may differ from Schedules A. Parties to such agreements shall be the General Contractor, the Contractor involved, the involved Local Unions and the BTC.

SECTION 2. EMPLOYEE BENEFIT FUNDS

A. The Contractors agree to pay contributions on behalf of all employees covered by this Agreement to the established employee benefit funds in the amounts designated in the appropriate Schedule A; provided, however, that the Contractor and the Union agree that only such bona fide employee benefits as are explicitly required under N.J.S.A 34:11-56.30 of the New Jersey State Labor Law shall be included in this requirement and paid by the Contractor on this Project. Bona fide jointly trusted fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly protected under N.J.S.A. 34:11-56-30. Contractors shall not be required to contribute to non-N.J.S.A 34:11-56.30 benefits, trusts or plans.

D. The Contractor agrees to be bound by the written terms of the legally established Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to Work done on this Project and only for those employees

to whom this Agreement requires such benefit Payments.

C. Should any Contractor or sub-contractor become delinquent in the payment of contributions to the fringe benefit funds, then the subcontractor at the next higher tier, or upon notice of the delinquency claim from the Union or the Funds, agrees to withhold from the subcontractor such disputed amount from the next advance, or installment payment for Work performed until the dispute has been resolved.

ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1. WORK WEEK AND WORK DAY

A. The standard work week shall consist of 40 hours of work at straight time rates per one of the following schedules:
   1) Five-Day Work Week: Monday-Friday, 5 days, 8 hours plus 1/2 hour unpaid lunch period each day.
   (2) Four-Day Work Week: Monday-Thursday; 4 days, 10 hours plus 1/2 hour unpaid lunch period each day.

B. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 7:30 p.m. Starting and quitting times shall occur at the employees' place of work as may be designated by the Contractor.

E. Scheduling - The Contractor shall have the option of scheduling either a five-day work week, or four-day work week (when mutually agreed upon on a craft-by-craft basis). The Contractor shall also has the option to set the work day hours consistent with Project requirements, the Project schedule, and minimization of interference with County operations traffic flow. When conditions beyond the control of the Contractor, such as severe weather, power failure, fire or natural disaster, prevent the performance of Project Work on a regularly scheduled work day, the Contractor may, with mutual agreement of the Local Union on a craft-by-craft basis, schedule Friday (where on 4, 10's) during the calendar week in which a workday was lost, at straight time pay; providing the employees involved work a total of 40 hours or less during that work week.

D. Notice - Contractors shall provide not less than 5 days prior notice to the Local Union involved as to the work week and work hours schedules to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2. OVERTIME

Overtime pay for hours outside of the standard work week and work day, described in paragraph A above, shall be paid in accordance with the applicable Schedule A. There will be no restriction upon the Contractor's scheduling of overtime or the non-

discriminatory designation of employees who shall be worked, except as noted in Article 5, Section 2. There shall be no pyramiding of overtime pay under any circumstances. The Contractor shall have the right to schedule work so as to minimize overtime.

SECTION 3. SHIFTS

A. Flexible Schedules - Scheduling of shift work shall remain flexible in order to meet Project schedules and existing Project conditions including the minimization of interference with County operations. It is not necessary to work a day shift in order to schedule a second shift. Shifts must be worked a minimum of five consecutive work days, must have prior approval of the Construction Project Manager and must be scheduled with not less than five work days notice to the Local Union.

B. Second/Shift - The second shift (starting between 2 p.m. and 8p.m.) shall consist of 8 hours work (or 10 hours of work) for an equal number of hours pay at the straight time rate plus 15% in lieu of overtime and exclusive of a 1/2 hour unpaid lunch period.

C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of paragraph A.

D. Four Tens - When working a four-day work week, the standard work day shall consist of 10 hours work for 10 hours of pay at the straight time rate exclusive of an unpaid 1/2 hour meal period and regardless of the starting time. This provision is applicable to night shifts only, and such night shifts are subject to the shift differential in paragraph B above.

E. It is agreed that when Project circumstances require a deviation form the above shifts, the involved unions, Contractors and the General Contractor shall adjust the starting times of the above shifts or establish shifts which meet the Project requirements. It is agreed that neither party will unreasonably withhold their agreement.

SECTION 4. HOLIDAYS

A. Schedule - There shall be 8 recognized holidays on the Project:

New Years Day	Labor Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day
Fourth of July	Christmas Day

*Work shall be scheduled on Good Friday pursuant to the craft's Schedule A.

All said holidays shall be observed on the dates designated by New Jersey

State Law. In the absence of such designations, they shall be observed on the calendar date except those holidays which occur on Sunday shall be observed on the following Monday. Holidays falling on Saturday are to be observed on the preceding Friday.

B. Payment - Regular holiday pay, if any, and/or premium pay for work performed on such a recognized holiday shall be in accordance with the applicable Schedule A.

C. Exclusivity - No holidays other than those listed in Section 4-A above shall be recognized nor observed except in Presidential Election years when Election Day is a recognized holiday.

SECTION 5. REPORTING PAY

A. Employees who report to the Work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason, shall receive minimum reporting pay in accordance with the applicable Schedule A.

B. When an employee, who has completed their scheduled shift and left the Project site, is "called back" to perform special Work of a casual, incidental or irregular nature, the employee shall receive pay for actual hours worked with a minimum guarantee, as may be required by the applicable Schedule A.

C. When an employee leaves the job or Work location of their own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, they shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article there shall be no premiums, bonuses, hazardous duty, high time or other special payments of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Agreement and except where an applicable Schedule A requires a full weeks pay for forepersons.

SECTION 6. PAYMENT OF WAGES

A. Payday - Payment shall be made by check, drawn on a New Jersey bank with branches located within commuting distance of the job site. Paychecks shall be issued by the Contractor at the job site by 10 a.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than 3 days wages shall be held back in any pay period. Paycheck stubs shall contain the name and

business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination-Employees who are laid-off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractors shall also provide the employee with a written statement setting forth the date of lay off or discharge.

SECTION 7. EMERGENCY WORK SUSPENSION

A Contractor or PMF may, if considered necessary for the protection of life and /or safety of employees or others, suspend all or a portion of Project Work. In such instances, employees will be paid for actual time worked; provided, however, that when a Contractor request that employees remain at the job site available for Work, employees will be paid for "stand-by" time at their hourly rate of pay.

SECTION 8. INJURY/DISABILITY

An employee who, after commencing Work, suffers a work-related injury or disability while performing work duties, shall received no less than 8 hours wages for that day. Further, the employee shall be rehired at such time as able to return to duties provided there is still work available on the Project for which the employee is qualified and able to perform.

SECTION 9. TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 10. MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the Work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

SECTION 11. BREAK PERIODS

There will be not rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's Work location. Local area practice will prevail for coffee breaks that are not organized.

ARTICLE 13 – APPRENTICES

SECTION 1. RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A in a ratio not to exceed 25% of the work force by craft (without regard to whether a lesser ratio is set forth in Schedule A), unless the applicable Schedules A provide for a higher percentage. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Schedule A.

SECTION 2. DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

To assist the Contractors in attaining a maximum effort on this Project, the Unions agree to work in close cooperation with, and accept monitoring by, the New Jersey State and Federal Departments of Labor to ensure that minorities, women, or economically disadvantaged are afforded opportunities to participate in apprenticeship programs which result in the placement of apprentices on this Project. To further ensure that this Contractor effort is attained, up to 50% of the apprentices placed on this Project should be first year, minority, women or economically disadvantaged apprentices. The Local Unions will cooperate with Contractor request for minority, women or economically disadvantaged referrals to meet this Contractor effort.

ARTICLE 14 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1. SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA requirements and other requirements set forth in the contract documents are at all times maintained on the Project and the employees and Unions agree to cooperate fully with these efforts. Employees must perform their work at all times in a safe manner and protect themselves and the property of the Contractor and the Owner from injury or harm. Failure to do so will be grounds for discipline, including discharge.

SECTION 2. CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors and the PMF for this Project. Such rules will be published and posted in conspicuous places throughout the Project.

SECTION 3. INSPECTIONS

The Contractors and PMF retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - NO DISCRIMINATION

SECTION 1. COOPERATIVE EFFORTS

The Contractors and Unions agree that they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or age in any manner prohibited by law or regulation. It is recognized that special procedures maybe established by Contractors and Local Unions and the New Jersey State Department of Labor and Workforce Development for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement will assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project.

SECTION 2. LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE 16 - GENERAL TERMS

SECTION 1. PROJECT RULES

The Project Management Firm and the Contractors shall establish such reasonable Project rules as are appropriate for the good order of the Project, provided they do not violate the terms of this agreement. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

SECTION 2. TOOLS OF THE TRADES

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the Work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdiction.

SECTION 3. SUPERVISION

Employees shall work under the supervision of the craft foreperson or general foreperson.

SECTION 4. TRAVEL ALLOWANCES

There shall be no payments for travel expenses; travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement and in Schedule A limited to travel expenses.

SECTION 5. FULL WORK DAY

Employees shall be at their staging area at the starting time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6. COOPERATION

The Project Management Firm and the Unions will cooperate in seeking any New Jersey statutory Department of Labor and Workforce Development approvals that may be required for implementation of any terms of this Agreement.

ARTICLE 17 - SAVINGS AND SEPARABILITY

SECTION 1. THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of the Agreement shall remain in full force and effect. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties to this Agreement will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be let in the future.

SECTION 2. THE BID SPECIFICATIONS

In the event that the General Contractor's bid specifications, or other action, requiring that a successful bidder become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law such requirement shall be rendered, temporarily or permanently, null and void but the Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in constructions where the Contractor voluntarily accepts the Agreement. The parties will

enter in to negotiations as to modifications to the Agreement to reflect the court action taken and the intent of the parties for contracts to be let in the future.

SECTION 3. NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither UC, the Project Management Firm, or any Contractor, or any signatory Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4. NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

ARTICLE 18 – FUTURE CHANGES IN SCHEDULE "A" AREA CONTRACTS

SECTION 1. CHANGES TO AREA CONTRACTS

A. Schedules "A" to this Agreement shall continue to full force and effect until the Contractor and/or Union parties to the Area Collective Bargaining Agreements which are the basis for Schedules A notify the General Contractor in writing of the mutually agreed upon changes in provisions of such agreements which are applicable to the Project, and their effective dates.

B. It is agreed that any provisions negotiated into Schedules "A" collective bargaining agreements will not apply to work on this Project than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provisions be recognized or applied on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Project Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedules "A" of provisions agreed upon in the negotiations of Area Collective Bargaining Agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there will be not strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiations of Area Local Collective Bargaining Agreements nor shall there be any lock-out on the Project affective a Local

Union during the course of such renegotiations.

IN WITNESS WHEREOF the parties hereto have, either individually or by their duly authorized representative, caused this Agreement to be executed and to become effective as of the _____ day of _____, 2021.

ATTEST:

_____
JAMES E. PELLETTIERE, CLERK
Board of County Commissioners

APPROVED AS TO FORM

_____
Bruce H. Bergen, ESQ.
County Counsel

COUNTY OF UNION

By:_____
EDWARD T. OATMAN
County Manager

ATTEST:

_____
Corporate Secretary/Notary Public

_____
Print Name

CONTRACTOR

_____
President/Authorized Signatory

_____
Print Name

_____
Print Title

ATTEST:

_____
Corporate Secretary/Notary Public

_____
Print Name

CONSTRUCTION MANAGER FIRM

_____
President/Authorized Signatory

_____
Print Name

_____
Print Title

UNION COUNTY BUILDING & CONSTRUCTION TRADES COUNCIL
and on behalf of the following: Asbestos Local #32, Boilermakers Local #28, Bricklayers Local #4, Carpenters Local #715, Electricians Local #102, Elevator Construction Local #1, Ironworkers Local #480, Laborers Local #394, Operating Engineers Local #825, Painters Local #711, Plumbers Local #24, Roofers Local #4, Sheet Metal Workers Local #22, Sheet Metal Workers Local #25, Sheet Metal Workers Local #137, Sprinkler Fitters Local #696, Steam Fitters Local #475, Teamsters Local #408

ATTEST:

_____ _____
Witness

_____
Print Name

LETTER OF ASSENT REQUIRED FROM ALL SUBCONTRACTORS (OF ANY TIER)

County of Union Project Labor Agreement

The undersigned, as a Contractor(s) or Subcontractor(s) on a Contract which is part of the _____ Project, for and in consideration of the award of a Contract to perform Work on said Project, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

(1) On behalf of itself and all its employees, accepts and agrees to be bound by terms and conditions of the Project Labor Agreement, together with any and all amendments and supplements now existing or which are later made thereto, and understands that any act of non-compliance with all such terms and conditions, including but not limited to, evidence of compliance with the pre-employment controlled substance testing, will subject the non-complying Contractor or employee(s) to being prohibited from the Project Site until full compliance is obtained.

(2) Certified that it has no commitments or agreements, which would preclude its full compliance with the terms and conditions of said Project Labor Agreement.

(3) Agrees to secure from any Contractor(s) (as defined in said Project Labor Agreement) which is or becomes a Subcontractor(s) (of any tier), a duly executed Letter of Assent in form identical to this document prior to commencement of any Work.

DATED:

_____
Name of Contractor/Company

_____
Signature of Authorized Representative

_____
Print Name and Title

_____
General Contractor

_____
Contract Number (BA#)

*** To be signed if Project is subject to Project Labor Agreement – See Section 56.**

56. BID PROTEST – LEGAL FEES AND COSTS

In the event a Bidder unsuccessfully challenges a Bid Submission by filing an action in a court of law concerning same, said Bidder shall be responsible for payment of reasonable legal costs and fees incurred by the County relating to said protest.

57. AMERICAN GOODS AND PRODUCTS WHERE POSSIBLE

Bidder shall comply with the requirements of N.J.S.A. 40A:11-18 and use only manufactured and farm products of the United States, wherever available, for the Project.

58. NEW JERSEY PAY-TO-PLAY REQUIREMENTS

This Contract is required by law to be publicly advertised for bids. As such, lists of political contributions pursuant to N.J.S.A. 19:44A-1 et seq. are NOT REQUIRED to be provided with the bids.

59. STATEMENT OF EQUIPMENT TO BE USED IN CONSTRUCTION

Pursuant to N.J.S.A. 40A:11-20 entitled Certificate of Bidder Showing Ability to Perform Contract, the County requires a Certification from all bidders submitting a bid showing that the Bidder owns, leases, or controls all necessary equipment required by the Project Plans and Specifications. All bidders shall provide this information at the time of the bid opening using the attached form entitled, “CERTIFICATE OF BIDDER SHOWING ABILITY TO PERFORM CONTRACT’.

If the Bidder is not the actual owner of the equipment, it shall state the source from which the equipment will be obtained and shall attach a certificate from the owner or person in control of the equipment demonstrating that the equipment owner has granted the Bidder control of the requisite equipment during such time as may be necessary for completion of the portion of the contract for which the equipment is necessary.

60. NEW JERSEY SALES AND USE TAX REQUIREMENTS,

Contractors are required to comply with the following:

> New Jersey Sales and Use Tax Requirements: All contractors with subcontractors, or any of their affiliates, who enter into contracts for the provision of goods or services with or for New Jersey local government entities, are required to collect and remit to the New Jersey Director of Taxation in the Department of the Treasury the use tax due on all of their sales of tangible personal property delivered into the State of New Jersey pursuant to the “Sales and Use Tax Act,” (NJSA 54:32B-1 et seq.), regardless of whether the tangible personal property is intended for a contract with the contracting agency. This tax shall be remitted for the term

of the Contract.

For purposes herein “affiliate” shall mean any entity that: (a) directly, indirectly, or constructively controls another entity, (b) is directly, indirectly, or constructively controlled by another entity, or (c) is subject to the control of a common entity. For purposes of the immediately preceding sentence, an entity controls another entity if it owns, directly or indirectly, more than fifty percent (50%) of the ownership interest in that entity. NJSA 52:32-44(g)(3).

Bidder's Name___

EDWARD T. OATMAN
COUNTY MANAGER

MICHELE HAGOPIAN, ASSISTANT DIRECTOR
DIRECTOR / DIVISION OF PURCHASING

BID DOCUMENT SUBMISSION CHECKLIST
ALL SIGNATURES AND SEALS SHALL BE ORIGINALS UNLESS OTHERWISE SPECIFIED
BID SHEETS SHOULD NOT BE SUBMITTED DOUBLE SIDED PAGES, (SINGLE SIDE ONLY)

EACH BIDDER SHOULD COMPLETE THIS FORM AND INITIAL EACH ENTRY.
DATE COMPLETED: _____

PLEASE SUBMIT BID DOCUMENTS ON SINGLE SIDED PAPER ONLY, WITH THE EXCEPTION OF THE SURETY AND BID BOND DOCUMENTS.

IN ACCORDANCE WITH THE BID SPECIFICATIONS I HAVE REVIEWED, COMPLETED / EXECUTED AND INCLUDED THE FOLLOWING FORMS:

_____ Bid Form Page **(Signed, Dated and Bid on all alternatives applicable to the Work)**.

_____ Security in the form of:
____ Bid bond in an amount equal to 10% of the total amount of this bid not to exceed $20,000.00; or
____ Certified check or cashier's check in the amount of 10% of this bid not to exceed $20,000.00

_____ Consent of Surety form signed by a Surety Company if the total amount of your Bid is over $36,000.00. If your bid is accepted, the Surety Company that provided the Consent shall be required to furnish a Performance, Labor and Materials Bond in the amount of 100% of the award of the contract. The County of Union has provided its Consent of Surety form for your use. The use of this form by your Surety Company will expedite the bid review process and eliminate the possibility of having your bid rejected. If, however, you should need to use another form, please use language similar to that used on the Union County form and avoid making any additions or deletions to the Union County form language. In lieu of the Consent of Surety you may submit a Certified Check in the full amount of the bid.

_____ STATEMENT OF BIDDER OWNERSHIP. Pursuant to N.J.S.A. 52:25-24.2, which includes **BOTH** of the following documents:

- Bidder Signature Page
- Bidder Disclosure Statement **(Fill out 2 pages completely)**

_____ SUBCONTRACTOR IDENTIFICATION. Pursuant to N.J.S.A. 40A:11-16, which includes **BOTH** of the following documents:

- Subcontractor Identification Statement: List of Subcontractors **(only for certain types of work)**
- Subcontractor Identification Certification

_____ Acknowledgement of Addendum form**: (This form is to be used only when an addendum has been added to the specifications)**.

_____ A copy of the State of New Jersey Department of the Treasury, Division of Revenue, **Business Registration Certificate ("BRC")** should be included with the bids as it must be received by the County prior to the award of the contract. The BRC provided must show that the Bidder was registered at the time of receipt of bids or the bid will be rejected.

_____ A copy of the State of New Jersey Department of the Treasury, Division of Revenue, **Business Registration Certificate ("BRC")** of all named or listed subcontractors (List of Subcontractors) in a Construction bid should be included with the bid as the BRC(s) must be received by the County prior to the award of the contract. Each subcontractor's certificate provided must show that the subcontractor was registered at the time of the receipt of bids or the bid will be rejected.

Bidder's Name___

_____ Affirmative Action Requirement

_____ Experience Statement

_____ Certificate of Bidder showing ability to perform Contract

_____ Non-Collusion Affidavit – Fill out completely and notarize

_____ Certificates from New Jersey Department of Labor – Public Works Contractor Registration Act. **(Only for certain types of work)**

_____ Federal Attachments **(If applicable)**

_____ NJDPMC Certificate / Notice of Classification **(If applicable)**

_____ Americans with Disabilities Act

_____ Statement of Bidder's Qualifications

_____ Contractor Performance Record

_____ Affidavit Regarding List of Debarred, Suspended or Disqualified Bidders

_____ Prior Negative Experience Questionnaire

_____ Contractor's Certification of Compliance – New Jersey Prevailing Wage Act

_____ Uncompleted Contracts Affidavit **(For Bidder, if applicable) MUST ALSO PROVIDE DPMC FORM 701**

_____ Certificate of Insurance Statement

_____ Collection of Use Tax on Sales to Local Government Statement

_____ Acknowledgement of Project Labor Agreement (PLA)

_____ Time of Completion

_____ Disclosure of Investment Activities in Iran Certification Form

I HAVE TAKEN THE FOLLOWING ACTIONS:

_____ Visited the site and attended the Pre-Bid Meeting **(Where applicable)**

_____ Reviewed the Contract Documents (including any permits the County or its professionals may have obtained), Work, Site, Locality, and Local Conditions and Laws and Regulations that in any manner may affect Cost, Progress, Performance or Furnishing of Work.

_____ Reviewed Bond Requirements

_____ Provided Proof of Compliance with New Jersey Prevailing Wage Act

_____ Reviewed Form of Owner/Contractor Agreement and General Conditions to the Contract

NOTE: QUESTIONS PERTAINING TO THIS BID ARE TO BE DIRECTED TO DIVISION OF ENGINEERING AT 908-789-3675

BIDDING DOCUMENTS

The Bidding Documents consist of the following items:

- **ADDENDA, if issued**
- **CLARIFICATIONS, if issued**
- **INSTRUCTION TO BIDDERS**
- **BID FORM**
- **OWNER-CONTRACTOR AGREEMENT (AIA 101) AND GENERAL CONDITIONS (AIA 201)**
- **SPECIFCATIONS: As outlined in the Table of Contents and included in the Project Manual.**
- **DRAWINGS: As per List of Drawings, indicated on the Project Title Sheet.**

Bidder's Name___

BID FORM

I/We have carefully examined the plans, specifications, and advertisement for bid for the

Union County Parking Deck at Caldwell Place & Elizabethtown Plaza
City of Elizabeth,
County of Union, New Jersey
BA# 38-2021; Union County Engineering Project #2019-026

that is on file in the Union County Division of Engineering. I/We have inspected the site of the work and will contract to do all the work and furnish all materials mentioned in said plans and specifications. Work will be accomplished in the manner prescribed therein.

BASE BID ITEMS:

NO	ITEM DESCRIPTION	LUMP SUM BID PRICE
1	GENERAL CONDITIONS	
2	GL INSURANCE	
3	DEMOLITION	
4	ABATEMENT	
5	SITE WORK	
6	FOUNDATIONS	
7	SUPERSTRUCTURE	
8	EXTERNAL WALL AND WINDOWS	
9	ROOF COVERING	
10	INTERIOR FITOUT	
11	CONVEYING	
12	FIRE SUPPRESSION	
13	PLUMBING	
14	HVAC	
15	ELECTRICAL, COMMUNICATIONS AND SECURITY	
16	FIRE ALARM	

17	EXTERIOR IMPROVEMENTS	
18	3RD PARTY TESTING & INSPECTION ALLOWANCE	$25,000.00

I. TOTAL BASE BID ITEMS (Items 1-18)

Written Figures

II. BID CONTIGENCY (to be used if and when directed by the County):

Eight Hundred Thousand Dollars **$800,000**

Written Figures

III. TOTAL LUMP SUM BASE BID PLUS CONTINGENCY AMOUNT (I. + II.):

Written Figures

NOTE: Bid Contingency may include one-half of one percent of contract amount set aside for local training if and when directed by the County.

Bidder's Name___

CONSENT OF SURETY
TO ACCOMPANY PROPOSAL (BID)

_____ (hereinafter called Surety), organized and existing under the laws of the State of _____ duly authorized and qualified to transact business in the State of New Jersey, in consideration of the sum of One Dollar ($1.00), lawful money of the United States of America, to it in hand paid, receipt whereof is hereby acknowledged, and in consideration, hereby certifies and agrees that if the contract for which the attached proposal is made be awarded to _____ (hereinafter called Contractor) for the performance of certain work and labor or the supplying of certain materials, or both, as more particularly set forth in said proposal and described for purposes of this instrument as a proposal for _____ to the COUNTY OF UNION and if Contractor shall enter into the contract, Surety will become bound as surety for its faithful performance, labor and material payment and will provide the Contractor with a performance, labor and material payment bond in the full amount of the contract price.

NOTE:
Expiration date
Needed if Annual
Surety

_____

_____
NAME OF INSURANCE COMPANY

ADDRESS: _____
_____
_____

_____
ORIGINAL SIGNATURE
ATTORNEY-IN-FACT FOR INSURANCE CO.

NOTE: PROOF OF AUTHORITY OF OFFICERS OF SURETY COMPANY TO EXECUTE THIS DOCUMENT MUST BE SUBMITTED.

Bidder's Name___

BIDDER SIGNATURE PAGE

THE BIDDER MUST READ THE FOLLOWING INSTRUCTIONS TO COMPLETE THIS PAGE:

1. If doing business under a **trade name, partnership or a sole proprietorship**, you must submit the bid under exact title of the trade name, partnership, or proprietorship, and the bid must be signed by either the **owner**, or a **partner** and **witnessed** by a **notary public**.

2. If a **Corporation**, the bid must be signed by the **President** or **Vice President** and **witnessed** by a **Corporate Secretary** (corporate title must be exact) and **affix corporate seal**. If a Corporate Secretary does not exist, President or Vice President's signature shall be witnessed by a Notary Public.

3. Other persons **authorized** by **corporate resolution** to execute agreements in its behalf may also sign the bid documents (pages). **Copy of a resolution must accompany the bid**.

4. The person who signs this bid form **must also** sign the **Non-Collusion Affidavit**.

5. You **cannot** witness your own signature.

_____
NAME OF BIDDER

_____
_____
_____
ADDRESS OF BIDDER

_____
ORIGINAL SIGNATURE
CORPORATE SECRETARY

_____
PRINT NAME AND TITLE
CORPORATE SECRETARY

TEL: _____
FAX: _____
E-Mail: _____

BY: _____
ORIGINAL SIGNATURE

Corporate Seal

_____

_____
PRINT OR TYPE NAME AND TITLE

WARNING: IF YOU FAIL TO FULLY, ACCURATELY, AND COMPLETELY SUPPLY THE INFORMATION REQUESTED ON THIS PAGE, YOUR BID MAY BE REJECTED.

Bidder's Name___

STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization:_____

Organization Address:_____

Part I Check the box that represents the type of business organization:

☐ Sole Proprietorship (skip Parts II and III, execute certification in Part IV)

☐ Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)

☐ For-Profit Corporation (any type) ☐ Limited Liability Company (LLC)

☐ Partnership ☐ Limited Partnership ☐ Limited Liability Partnership (LLP)

☐ Other (be specific): _____

Part II

☐ The list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. (**COMPLETE THE LIST BELOW IN THIS SECTION**)

OR

☐ No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be. (**SKIP TO PART IV**)

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Home Address (for Individuals) or Business Address

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed**.

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above**. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Home Address (for Individuals) or Business Address

Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that the ***County of Union*** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with ***County of Union*** to notify the ***County of Union*** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the, permitting the ***County of Union*** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

Bidder's Name___

SUBCONTRACTOR IDENTIFICATION STATEMENT

LIST OF SUBCONTRACTORS

This form is ONLY required for plumbing and gas fitting, steam and hot water heating and ventilating apparatus, steam power plants, electrical work, structural steel, ornamental iron work, and any other trades required to be identified by the specifications (including, but not limited, to satisfying any DPMC Classification requirements).

☐ **CHECK THIS BOX IF NONE OF THE ABOVE LISTED TRADES OR THOSE REQUIRED TO BE IDENTIFIED IN THE SPECIFICATIONS ARE TO BE USED TO PERFORM THE WORK**

In compliance with N.J.S.A. 40A:11-16 and the bid specifications, the undersigned hereby lists the name or names of the following subcontractors:

Company Name:_____

Address:_____

Telephone: _____ Subcontract Amount: $_____

Specific Scope of Work Subcontracted: _____

_____

License No. _____

Company Name:_____

Address: _____

Telephone: _____ Subcontract Amount: $_____

Specific Scope of Work Subcontracted: _____

_____

License No. _____

Company Name:_____

Address: _____

Telephone: _____ Subcontract Amount: $_____

Specific Scope of Work Subcontracted: _____

_____

License No. _____

IF MORE THAN THREE SUBCONTRACTORS, PLEASE COPY THIS SHEET AS NECESSARY AND ATTACH TO THE BID PACKAGE.

(Continued on following page)

Bidder's Name___

SUBCONTRACTOR IDENTIFICATION CERTIFICATION

Note the law does not permit the listing of alternate subcontractors. However, multiple subcontractors for the same trade are permitted to be named provided the bidder meets the following requirements:

- Bidder identifies each subcontractor named for that category;
- Bidder states the scope of work, goods and services (the portion of the work) to be performed by each subcontractor; and
- Bidder provides the price quote provided by each subcontractor.

The bidder is advised that any change of subcontractor(s) from ones listed herein is subject to the County's approval. Change of subcontractor(s) will be approved only if made for good cause and not as a result of an arbitrary purpose.

The undersigned Bidder certifies and declares that the subcontractors listed above shall be used as subcontractors to complete certain portions of the work in this project as set forth in N.J.S.A. 40A: 11-16.

Witness

Date _____

NAME OF BIDDER

ADDRESS

By:

ORIGINAL SIGNATURE ONLY

PRINT NAME AND TITLE

Bidder's Name___

ACKNOWLEDGMENT OF ADDENDUM

COUNTY OF UNION

_____ _____

(Name of Construction /Public Works Project) **(Project or Bid Number)**

Pursuant to N.J.S.A. 40A:11-23.1a., the undersigned bidder, hereby acknowledges receipt of the following notices, revisions, or addenda to the bid advertisement, specifications or bid documents. By indicating date of receipt, bidder acknowledges the submitted bid takes into account the provisions of the notice, revision or addendum. Note that the County of Union's record of notice to bidders shall take precedence and that failure to include provisions of changes in a bid proposal may be subject for rejection of the bid.

Local Unit Reference Number or Title of Addendum/Revision	How Received (mail, fax, pick-up, etc.)	Date Received

ACKNOWLEDGMENT BY BIDDER:

NAME OF BIDDER: _____

ORIGINAL SIGNATURE: _____

PRINTED NAME AND TITLE:_____

DATE: _____

Bidder's Name_____

CONTRACTOR BUSINESS REGISTRATION CERTIFICATE

New Mandatory Requirement - Effective 1/18/2010

The recently enacted **P.L. 2009, c.315**, requires that effective January 18, 2010; a contracting agency must receive proof of the bidder's business registration prior to the award of a contract. However, the proof must show that the bidder was in fact registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

If subcontractors are named on the bid, proof of the business registration for each subcontractor must be provided prior to the award of bid. Similarly to the bidder, the proof must show that each subcontractor was registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

Proof of business registration shall be

- ☐ A copy of a Business Registration Certificate issued by the Department of the Treasury, Division of Revenue; or
- ☐ A copy of the web version provided by the NJ Division of Revenue, or

Register online at www.nj.gov/treasury/revenue/taxreg.htm. Click the "online" link and then select "Register for Tax and Employer Purposes or call the Division at 609-292-1730.
Note: A NJ Certificate of Authority is <u>not</u> acceptable.

FAILURE to submit proof of registration of the bidder or any subcontractor named on the bid prior to the award of a contract shall be cause to reject the bids.

FAILURE of the bidder or any subcontractor named on the bid to be <u>registered</u> prior to the receipt of bids is cause for a **MANDATORY REJECTION** of bids. (A NON-WAIVABLE DEFECT). This covers construction work as well as non-construction bids.

IN ADDITION:

The contractor shall provide written notice to all **subcontractors and suppliers** not specifically named on the bid of the responsibility to register and submit proof of business registration to the contractor. The requirement of proof of business registration extends down through all levels (tiers) of the project.

Before final payment on the contract is made by the contracting agency, the contractor shall submit an accurate list and the proof of business registration of each subcontractor or supplier used in the fulfillment of the contract, or shall attest that no subcontractors were used.

For the term of the contract, the contractor and each of its affiliates and a subcontractor and each of its affiliates [N.J.S.A. 52:32-44(g)(3)] shall collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act on all sales of tangible personal property delivered into this State, regardless of whether the tangible personal property is intended for a contract with a contracting agency.

A business organization that fails to provide a copy of a business registration as required pursuant to section 1 of P.L.2001,c.134 (C.52:32-44 et al.) or subsection e. or f. of section 92 of P.L.1977,c.110 (C.5:12-92), or that provides false business registration information under the requirements of either of those sections, shall be liable for a penalty of $25 for each day of violation, not to exceed $50,000 for each business registration copy not properly provided under a contract with a contracting agency.

Bidder's Name_____

BUSINESS REGISTRATION

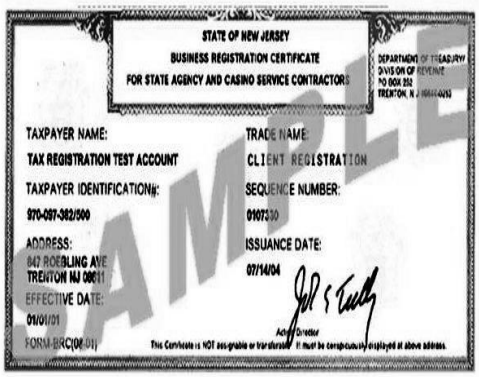
Mandatory Requirement

P.L. 2009, c.315, requires that effective January 18, 2010; a contracting agency must receive proof of the bidder's business registration prior to the award of a contract. However, the proof must show that the bidder was in fact registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

If subcontractors are named on the bid, proof of the business registration for each must be provided prior to the award of a contract. Similarly to the bidder, the proof must show that each subcontractor was registered with the State of New Jersey Department of the Treasury, Division of Revenue and obtained the business registration prior to the receipt of bids.

Proof of business registration shall be:

- A copy of a Business Registration Certificate issued by the Department of Treasury, Division of Revenue; or
- A copy of the web printed version provided by the NJ Division of Revenue



STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE
FOR STATE AGENCY AND CASINO SERVICE CONTRACTORS

DEPARTMENT OF TREASURY
DIVISION OF REVENUE
PO BOX 252
TRENTON, N.J.

TAXPAYER NAME:
TAX REGISTRATION TEST ACCOUNT

TRADE NAME:
CLIENT REGISTRATION

TAXPAYER IDENTIFICATION#:
970-097-382/000

SEQUENCE NUMBER:
0107330

ADDRESS:
847 ROEBLING AVE
TRENTON NJ 08611

ISSUANCE DATE:
07/14/04

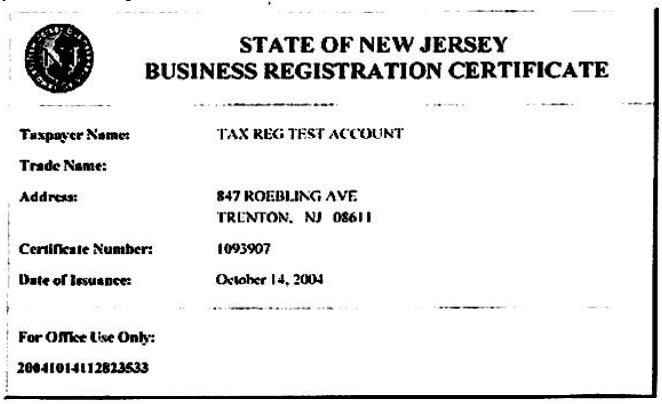
EFFECTIVE DATE:
01/01/01

Acting Director

FORM BRC(08.01)

This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.

SAMPLE



STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE

Taxpayer Name:	TAX REG TEST ACCOUNT
Trade Name:	
Address:	847 ROEBLING AVE TRENTON, NJ 08611
Certificate Number:	1093907
Date of Issuance:	October 14, 2004

For Office Use Only:
20041014112823533

ATTACH BRC HERE

Bidder's Name___

AFFIRMATIVE ACTION REQUIREMENT

REQUIRED AFFIRMATIVE ACTION EVIDENCE

General Requirements of P.L. 1975, c. 127: You are hereby put on notice that:

CONSTRUCTION CONTRACTS: The successful contractor must submit within three (3) days of the notice of intent to award or the signing of the contract the initial project manning report (A.A.201). This report should be submitted at the time the signed contract is returned to the County of Union. Attention: *Affirmative Action Officer.*

If the successful contract does not submit the initial project manning report (A.A.201) within the three (3) days from the time the signed contract is returned to the County of Union, the County of Union WILL declare the contractor non-responsive and award the contract to the next lowest responsible bidder.

_____
NAME OF BIDDER

_____
ORIGINAL SIGNATURE

_____
PRINT OR TYPE NAME AND TITLE

_____
DATE THIS FORM IS COMPLETED

Bidder's Name___

EXPERIENCE STATEMENT

I hereby certify that my company has performed the following private or public work, which is relevant to this bid. I further certify that my company has never defaulted under any contract. Should you not sign this form due to prior defaults, please provide details on an attached sheet.

_____
Witness

_____
Date

_____
NAME OF BIDDER

_____
_____
_____
ADDRESS

By: _____
ORIGINAL SIGNATURE ONLY

_____

_____
PRINT NAME AND TITLE

YOU MAY ATTACH ADDITIONAL SHEETS, BUT YOU MUST SIGN AND WITNESS THIS SHEET.

Bidder's Name___

CERTIFICATE OF BIDDER SHOWING ABILITY TO PERFORM CONTRACT

STATE OF NEW JERSEY / _____)
Specify, if Other) SS:
COUNTY OF _____)

I, _____, of the (City, Town, Borough, etc.) of ___ _____ State of _____, of full age, being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____, the Bidder making the proposal for the above named Project ("Contractor'), and that I executed said proposal with full authority to do so; and that said Contractor, pursuant to N.J.S.A. 40A:11-20, certifies that it owns, leases or controls all the necessary equipment required by the Plans, Specifications and Advertisements under this Bids are asked for.

If the Bidder is not the actual owner or lessee of any such equipment, then the Bidder shall attach to this Certificate information identifying the source from which the equipment will be obtained, and such information shall be accompanied by a certificate from the owner or person in control of the equipment definitively granting to the Bidder the control of the equipment required during such time as may be necessary for the completion of that portion of the contract.

_____
(Also type or print name of affiant under signature)

By:_____

Bidder's Name___

NON-COLLUSION AFFIDAVIT

(N.J.S.A. 52:34-15)

STATE OF _____)
) **SS:**_____
COUNTY OF _____)

I _____, of the City of _____, in the County of _____, and the State of _____, of full age, being duly sworn according to law, on my oath depose and say that: I am _____ of the firm of _____, the bidder making the proposal for the above named project, and that I executed the said proposal for the above named project, and that I executed the said proposal with full authority to do so; that said bidder has not, directly or indirectly, entered into any agreement, participation in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said proposal and in this Affidavit are true and correct, and made with full knowledge that the COUNTY OF UNION, NEW JERSEY relies upon the truth of the statements contained in said proposal and in the statements contained in the affidavit in awarding the contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bonafide established commercial or selling agencies maintained by _____ (N.J.S.A. 52:34-15).

_____

NAME OF BIDDER

_____

ORIGINAL SIGNATURE ONLY

NOTE: The person who signed the bidder signature page for the bidder should sign this form also.

Subscribed and sworn before me
this _____day of _____, 20____.

_____
Notary Public of the State of _____
My commission expires: _____

WARNING: IF YOU FAIL TO FULLY, ACCURATELY, AND COMPLETELY FILL OUT THIS AFFIDAVIT OF NON-COLLUSION, YOUR BID MAY BE REJECTED.

Bidder's Name_____

Contractor Registration Advisement

For Public Works Projects

A new law, known as "The Public Works Contractor Registration Act" (P.L. 1999, c.238), became effective April 11, 2000. Under the Act, no contractor/subcontractor will be permitted to bid on or engage in any contract for public work, as defined in Section 2 of P.L. 1963, c.150 (C:34:11-56.26), unless that contractor/subcontractor is registered with the New Jersey Department of Labor. The Act provides that upon registration with the Department, a public works contractor/subcontractor will be issued a certificate by the Department indicating compliance with the Act's requirements. The registration fee has been set at $300.00 per year. Upon the effective date of the Act, public bodies will be expected to request production of such a certificate from those bidding on or engaging in public works projects.

It is important to note that the term "contractor," is defined in the, Act as, "a person, partnership, association, joint stock company, trust, corporation or other legal business entity or successor thereof who enters into a contract which is subject to the provision of the "New Jersey Prevailing Wage Act," P.L. 1963, c.150 (C.34:11-56.25, et seq.) for the construction, reconstruction, demolition, alteration, repair or maintenance of a public building regularly open to and used by the general public or a public institution, and includes any subcontractor or lower tier subcontractor as defined herein: except that, for the purposes of the act, no pumping station, treatment plant or other facility associated with utility and environmental construction, reconstruction, demolition, alteration, repair or maintenance shall be regarded as a public building regularly open to and used by the general public or a public institution."

Registration forms, copies of the Act, and other relevant information can be obtained by contacting:

Contractor Registration Unit
New Jersey Department of Labor
Division of Wage & Hour Compliance
PO Box 389
Trenton, New Jersey 08625-0389
Telephone: 609-292-9464
Fax: 609-633-8591
E-mail: contreg@dol.state.nj.us

Bidder's Name___

AMERICANS WITH DISABILITIES ACT

EQUAL OPPORTUNITY FOR INDIVIDUALS WITH DISABILITIES

The contractor and the County of Union (hereafter "Owner") do hereby agree that the provisions of Title II of the Americans With Disabilities Act of 1990 (the "Act") (42 US.C. S12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the Owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the Owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the Owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the Owner's grievance procedure, the contractor agrees to abide by any decision of the Owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the Owner, or if the Owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The Owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the Owner or any of its agents, servants, and employees, the Owner shall expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or process received by the Owner or its representatives.

It is expressly agreed and understood that any approval by the Owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the Owner pursuant to this paragraph.

It is further agreed and understood that the Owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the Owner from taking any other actions available to it under any other provisions of this Agreement or otherwise at law.

Name _____ **(Please print or type)**

Signature _____**Date** _____

Bidder's Name___

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. Questions may be answered on separate attached sheets. The Bidder may submit any additional information it desires.

1. _____
(Name of Bidder)

2. _____
(Permanent Main Office Address)

3. _____
(When Organized)

4. _____
(If a Corporation, where incorporated)

5. Number of years your organization has been engaged in construction or contracting business under present firm or trade name? _____

6. How many years of experience in construction work has your organization had (a) as a general contractor? And/or (b) As a subcontractor?_____

7. Contracts on hand: (Attach a list or table showing gross amounts of each Contract and the appropriate dates of completion)_____

_____

_____

_____

8. General character of work performed by you._____

_____

9. Have you ever failed to complete any work awarded to you? _____

_____

10. Have you ever defaulted on a Contract?_____ If so, complete details, including where and why?

_____

_____

Bidder's Name___

STATEMENT OF BIDDER'S QUALIFICATIONS - (continued)

11. Has any officer or partner of your organization ever failed to complete a construction contract handled in its own name? If so, state name of individual, name of owner, location and type of project, and reason for the failure to complete._____

_____

_____

12. List your major equipment available for this Contract.

_____

_____

13. Experience in the construction work similar in importance to this Project.

_____

_____

14. Have you had any material adverse changes from the trades as listed in NJ Notice of Classification within last five (5) years? _____. If so, list prior classification.

15. Background and experience of the principal members of your organization, including the officers.

Individual's Name	Present Position or Office	Yrs. of Construction Experience	Magnitude & Type of Work	In What Capacity

16. Bank Reference. (Name, Address, Phone, Representative) _____

17. Will you, upon request, fill out a detailed financial statement? _____

18. The undersigned, hereby authorizes and requests any person, firm or corporation to furnish any information requested by the proper agency in verification of the responses comprising this Statement of Bidder's Qualifications.

19. Bidder's telephone number, fax number and e-mail address (if applicable).

    Phone _____

    Fax _____

    E-mail_____

    Mobile _____

Dated at _____ this _____ day of _, 20__.

_____
BIDDER (Signature)

_____
BIDDER (Print Name)

Subscribed and sworn to before me
this _____ day of _____, 20__.

_____
(Seal) Notary Public of New Jersey/
Specify Other State
My Commission Expires_____, 20__.

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name___

CONTRACTOR PERFORMANCE RECORD

List all contracts completed by you below or provide separate form.

Name of Owner	Name & Location of Project: Type Of Work	Prime or Sub-Cont.	Engineer or Architect in Charge for Owner	Contract Price (Omit Cost)	Date Completed	Was Time* Extension Necessary	Were Any Penalties Imposed	Were Liens* Claims or Stop Notice Filed

* If answer is YES, provide explanation of details in connection with non-completion of contracts, time extensions, penalties imposed, labor troubles, liens, claims and notices filed against contracts listed in preceding item "Performance Record" on an attached sheet.

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

CONTRACTOR PERFORMANCE RECORD

CERTIFICATION

The information above is true and complete to the best of my knowledge and belief.

_____
(Name of Organization)

_____
(Signature)

_____
(Title)

Subscribed and sworn to before me
this _____ day of _____, 20__.

_____
(Seal) Notary Public of New Jersey/
Specify Other State

My Commission Expires_____, 20__.

Bidder's Name___

AFFIDAVIT REGARDING LIST OF DEBARRED, SUSPENDED OR DISQUALIFIED BIDDERS

STATE OF NEW JERSEY / _____)
Specify, if other

SS:

COUNTY OF _____)

I, _____, of the (City, Town, Borough, etc.) of _____

_____ State of _____, of full age, being

duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____

_____, the Bidder making the Proposal for the above named Project. I have executed the said Proposal with full authority to do so. Said Bidder is not at the time of the making this bid included on the New Jersey State Treasurer's or the Federal Government's List of Debarred, Suspended or Disqualified Bidders as a result of action taken by any State or Federal Agency.

_____
Name of Contractor

By:_____
(Signature of Authorized Representative)

Subscribed and sworn to before me
this _____ day of _____, 20__.

_____
(Seal) Notary Public of New Jersey/
Specify Other State
My Commission Expires_____, 20__.

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name___

PRIOR NEGATIVE EXPERIENCE QUESTIONNAIRE

(N.J.S.A. 40A:11-4)

1. Within the past ten (10) years, have you been found, through either court adjudication, arbitration, mediation, or other contractually stipulated alternate dispute resolution mechanism, to have: failed to provide or perform goods or services; or failed to complete a contract in a timely manner; or otherwise performed unsatisfactorily under a prior contract with a public entity?

   _____ yes _____ no If yes, please provide full, detailed explanation.

2. Within the past ten (10) years, have you defaulted on a contract, thereby requiring a public entity to utilize the services of another contractor to provide the goods or perform the services or to correct or complete the contract?

   _____ yes _____ no If yes, please provide full, detailed explanation.

3. Within the past ten (10) years, have you defaulted on a contract, thereby requiring a public entity to look to your surety for completion of the contract or tender of the costs of completion?

   _____ yes _____ no If yes, please provide full, detailed explanation.

4. Within the past ten (10) years, have you been debarred or suspended from contracting with any of the agencies or department of the executive branch of the State of New Jersey at the time of the contract award, where the action was based on failure to perform a contact for goods or services with a public entity?

   _____ yes _____ no If yes, please provide full, detailed explanation.

Bidder's Name___

PRIOR NEGATIVE EXPERIENCE CERTIFICATION

I hereby certify that the above statements are true and accurate as of this _____ day of _____, 20__.

_____
Name of Contractor

By_____
(Signature of Authorized Representative)

Subscribed and sworn to before me
This _____ day of _____, 20__.

_____
(Seal) Notary Public of New Jersey/
Specify Other State
My Commission Expires_____, 20__.

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name___

TO BE COMPLETED ONLY WHEN FINAL PAYMENT IS REQUESTED

CONTRACTOR'S CERTIFICATION OF COMPLIANCE - NEW JERSEY PREVAILING WAGE ACT

TO: County of Union
Division of Engineering
2325 South Avenue
Scotch Plains, New Jersey 07076

CONTRACT:

PROJECT:

In accordance with the requirements of the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56 et al *****, the undersigned contractor on the public work being performed for:

COUNTY OF UNION

hereby certifies that he/she has complied with the contract requirements regarding the payment of the minimum prevailing wages established under "The New Jersey Prevailing Wage Act" N.J.S.A. 34:11-56 et al.

CONTRACTOR: _____
ADDRESS: _____
_____
BY: _____
ORIGINAL SIGNATURE ONLY

STATE OF NEW JERSEY
COUNTY OF _____

Being by me duly sworn according to law, on his oath deposes and says that _____is _____ of _____the above named contractor, and that the facts set forth in the above statement are true.

Subscribed and sworn before me this ____day of _____, 200___.

_____

Notary Public: _____
My Commission Expires: _____

***** N.J.S.A. 34:11-56.33 requires the contractor and subcontractor to file written statements with the public body in form satisfactory to the Commissioner certifying to the amounts then due and owing from such contractor and subcontractor filing such statement to any and all workmen for wages due on account of the public work, setting forth therein the names of the persons whose wages are unpaid and the amount due to each respectively. Union County will withhold the amount so deducted for the benefit of the workmen whose wages are unpaid as shown by the verified statement filed, and will pay directly to any workman the amount shown by such statement to be due to him for such wages. Such payment shall thereby discharge the obligation of the contractor to the person receiving such payment to the extent of the amount thereof.

Bidder's Name___

UNCOMPLETED CONTRACTS AFFIDAVIT

(To be Submitted with DPMC Form 701)

PURSUANT TO N.J.A.C. 17:19-2.13, BIDDER DECLARES THE FOLLOWING WITH RESPECT TO ITS UNCOMPLETED CONTRACTS, ON ALL WORK, FROM WHATEVER SOURCE (PUBLIC AND PRIVATE), BOTH IN NEW JERSEY AND FROM OTHER GOVERNMENTAL JURISDICTIONS				
ENTITY	**PROJECT TITLE**	**ORIGINAL CONTRACT AMOUNT**	**UNCOMPLETED AMOUNT AS OF BID OPENING DATE**	**NAME AND TELEPHONE NUMBER OF PARTY TO BE CONTACTED FROM ENTITY FOR VERIFICATION**

TOTAL AMOUNT OF UNCOMPLETED CONTRACTS $_____

Sworn and Subscribed to Before me

This _____day of _____20___

_____
Notary Public

BIDDER:

_____
(Signature)

_____
(Print Name)

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name___

CERTIFICATE OF INSURANCE STATEMENT

The Bidder fully understands the County of Union insurance requirements as stated in the Instructions to Bidders as well as the Owner/Contractor Agreement and agrees to provide all insurance required by these documents prior to the issuance of the Notice to Proceed.

BIDDER (Signature)

BIDDER (Print Name)

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name_____

COLLECTION OF USE TAX ON SALES TO LOCAL GOVERNMENTS STATEMENT

The Bidder fully understands the requirements of the use tax on sales to local governments as stated in the General Conditions to the Contract for Construction and the Instructions to Bidders, and agrees at all times to comply with the "Contractor Use Tax Collection Legislation", as defined therein, and the terms relating thereto contained in the Contract Documents.

_____
BIDDER (Signature)

_____
BIDDER (Print Name)

NOTE: FAILURE TO COMPLETE AND SUBMIT THIS DOCUMENT WITH YOUR PROPOSAL MAY RESULT IN A REJECTION OF YOUR BID.

Bidder's Name___

ACKNOWLEDGEMENT OF PROJECT LABOR AGREEMENT
(Projects of $5 Million of more irrespective of Phasing)

Contractor _____, hereby acknowledges that the within Project, upon which the undersigned has submitted a Bid Proposal, requires the execution of a Project Labor Agreement and the utilization of union employees. The undersigned agrees to execute the PLA and comply with all terms and conditions of same in the performance of the Work.

Contractor:_____

Attest:

By:_____

_____

Bidder's Name___

TIME OF COMPLETION

The undersigned proposed that if awarded the Contract, the scope of work will be started within ten (10)

calendar days and will be substantially completed within **Four Hundred and Forty Two (442) calendar days** from the date of

the notice to proceed.

I, _____ of _____
NAME (Print or type) COMPANY

Agree to complete work in the time frame specified _____
SIGNATURE

SITE VISIT – GENERAL CONTRACTOR

I, _____ of _____
NAME (Print or type) COMPANY

Visited the site of the work on _____ _____
SIGNATURE

Bidder's Name___

COUNTY OF UNION NEW JERSEY
Division of Purchasing
DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN FORM

Solicitation Number: _____ Vendor/Bidder: _____

PART 1

CERTIFICATION
VENDOR/BIDDER MUST COMPLETE PART 1 BY CHECKING ONE OF THE BOXES
FAILURE TO CHECK ONE OF THE BOXES WILL RENDER THE PROPOSAL NON-RESPONSIVE

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person nor entity, nor any of its parents, subsidiaries, or affiliates, is identified on the State of New Jersey, Department of the Treasury's Chapter 25 list as a person or entity engaged in investment activities in Iran. The Chapter 25 list is found on the Department's website at http://www.state.nj.us/treasury/pdf/Chapter25List.pdf. Vendors/Bidders **must** review this list prior to completing the below certification. **Failure to complete the certification will render a Vendor's/Bidder's proposal non-responsive.** If the Director of the Division of Purchase and Property finds a person or entity to be in violation of the law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

CHECK THE APPROPRIATE BOX

☐ A. I certify, pursuant to Public Law 2012, c.25, that neither the Vendor/Bidder listed above nor any of its parents, subsidiaries, or affiliates is listed on the N.J. Department of Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). Disregard Part 2 and complete and sign the Certification below.

OR

☐ B. I am unable to certify as above because the Vendor/Bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such information will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2

PLEASE PROVIDE ADDITIONAL INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

If you checked Box "B" above, provide a detailed, accurate and precise description of the activities of the Vendor/Bidder, or one of its parents, subsidiaries or affiliates, engaged in investment activities in Iran by completing the information below.

ENTITY NAME: _____
RELATIONSHIP TO VENDOR/BIDDER: _____
DESCRIPTION OF ACTIVITIES: _____
DURATION OF ENGAGEMENT: _____
ANTICIPATED CESSATION DATE: _____
VENDOR/BIDDER CONTACT NAME: _____
VENDOR/BIDDER CONTACT PHONE#: _____
Attach Additional Sheets If Necessary

CERTIFICATION

I, the undersigned, certify that I am authorized to execute this certification on behalf of the Vendor/Bidder, that the foregoing information and any attachments hereto, to the best of my knowledge are true and complete. I acknowledge that the County of Union, New Jersey is relying on the information contained herein, and that the Vendor/Bidder is under a continuing obligation from the date of this certification through the completion of any contract(s) with the County of Union to notify the County of Union in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification. If I do so, I will be subject to criminal prosecution under the law, and it will constitute a material breach of my agreement(s) with the County of Union, permitting the County of Union to declare any contract(s) resulting from this certification void and unenforceable.

_____ _____
Signature Date

_____
Print Name and Title

Revised 10/19/17

STANDARD SPECIFICATIONS

The Standard Specifications for Road and Bridge Construction of New Jersey Department of Transportation, 2019 Edition; is added to and/or amended elsewhere herein by the Notice to Contractors (Advertisement), Proposal, Information for Bidders, General Conditions, Supplemental Conditions, Project Plans, and Supplementary Specifications; shall, insofar as technical requirements are involved, govern in the execution of this project.

Such Standard Specifications are made a part of these Specifications by this reference and will not be repeated herein. It is the responsibility of prospective bidders to familiarize themselves with these Standard Specifications, copies of which may be examined at the office of the Engineer and may be obtained, upon payment of the cost thereof, from:

Department of Transportation
State of New Jersey
1035 Parkway Avenue
Trenton, New Jersey 08625

The Notice to Contractors (Advertisement), Proposal, General Conditions, Special Provisions, Project Plans and/or Supplementary Specifications shall govern and prevail in the case of conflict between them and the Standard Specifications.

In these Standard Specifications the words "COMMISSIONER" or "DEPARTMENT" shall refer to and mean the person, persons, body, board or agent legally empowered to enter into contracts and otherwise legally act for the Owner. The word "STATE" shall refer to and mean the professional engineering representative of the Owner as hereinbefore defined and the word "ENGINEER" shall refer to and mean the professional engineering representative of the Owner as hereinbefore defined and the word "INSPECTOR" shall mean the authorized project representative of the Engineer with the authority as hereinbefore defined. The word "LABORATORY" shall mean and refer to the Engineer who may, at his discretion, and with the consent of the Owner, employ qualified technical personnel or testing laboratories to assist him in fulfilling the duties normally assigned to the "LABORATORY" in these Standard Specifications.

When reference is made herein to the bulletins, standards, specifications, publications or requirements of the American Association of State Highway Official (AASHO), the American Concrete Institute (ACI), the American Society of Civil Engineers (ASCE) or similar national or regional societies, associations, institutes or organizations; the requirements of the bulletins, specifications, publications or requirements referred to shall be considered a part of these Specifications by such reference and shall not be repeated herein but shall have the same import and be as binding as if herein set forth in full.

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

☐ Not later than ( ) calendar days from the date of commencement of the Work.

☐ By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's

Init.

/

property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Cause of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

☐ **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance,** to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

☐ **§ A.2.4.2 Ordinance or Law Insurance,** for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

☐ **§ A.2.4.3 Expediting Cost Insurance,** for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

☐ **§ A.2.4.4 Extra Expense Insurance,** to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

☐ **§ A.2.4.5 Civil Authority Insurance,** for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

☐ **§ A.2.4.6 Ingress/Egress Insurance,** for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

☐ **§ A.2.4.7 Soft Costs Insurance,** to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

☐ **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

☐ § A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than _____ ($__) each occurrence, _____ ($__) general aggregate, and _____ ($__) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to, or destruction of, tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the work involves such hazards.

.11 Claims related to explosion, collapse, and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than _____ ($__) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than _____ ($__) each accident, _____ ($__) each employee, and _____ ($__) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than_____ ($__) per claim and_____ ($__) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than_____ ($__) per claim and_____ ($__) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

☐ **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below.

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

☐ **§ A.3.3.2.2 Railroad Protective Liability Insurance,** with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate, for Work within fifty (50) feet of railroad property.

☐ **§ A.3.3.2.3 Asbestos Abatement Liability Insurance,** with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

☐ **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

☐ **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

☐ **§ A.3.3.2.6 Other Insurance**

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

TABLE OF ARTICLES

Init.

/

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

/

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

STATE OF NEW JERSEY
Department of Labor and Workforce Development
Division of Wage and Hour Compliance - Public Contracts Section
PO Box 389
Trenton, NJ 08625-0389

PREVAILING WAGE RATE DETERMINATION

The New Jersey Prevailing Wage Act (N.J.S.A. 34:11-56.25 et seq.) requires that the Department of Labor and Workforce Development establish and enforce a prevailing wage level for workers engaged in public works in order to safeguard their efficiency and general well being and to protect them as well as their employers from the effects of serious and unfair competition.

Prevailing wage rates are wage and fringe benefit rates based on the collective bargaining agreements established for a particular craft or trade in the locality in which the public work is performed. In New Jersey, these rates vary by county and by the type of work performed.

Applicable prevailing wage rates are those wages and fringe benefits in effect on the date the contract is awarded. All pre-determined rate increases listed at the time the contract is awarded must also be paid, beginning on the dates specified. Rates that have expired will remain in effect until new rates are posted.

Prevailing Wage Rate

The prevailing wage rate for each craft will list the effective date of the rate and the following information:

W = Wage Rate per Hour **B** = Fringe Benefit Rate per Hour* **T** = Total Rate per Hour

* Fringe benefits are an integral part of the prevailing wage rate. Employers not providing such benefits must pay the fringe benefit amount directly to the employee each payday. Employers providing benefits worth less than the fringe benefit amount must pay the balance directly to the employee each payday.

Unless otherwise stated in the Prevailing Wage Rate Determination, the fringe benefit rate for overtime hours remains at the straight time rate.

When the Overtime Notes in the Prevailing Wage Rate Determination state that the overtime rates are "inclusive of benefits," the benefit rate is increased by the same factor as the wage rate (i.e. multiplied by 1.5 for time and one-half, multiplied by 2 for double time, etc.).

Apprentice Rate Schedule

An “apprentice” is an individual who is registered with the United States Department of Labor - Office of Apprenticeship and enrolled in a certified apprenticeship program during the period in which they are working on the public works project.

The apprentice wage rate is a percentage of the journeyman wage rate, unless otherwise indicated. The apprentice benefit rate is the full journeyman benefit rate, unless otherwise indicated.

If there is no apprentice rate schedule listed, the individual must be paid at least the journeyman rate even if that individual is in a certified apprentice program for that trade.

If there is no ratio of apprentices to journeymen listed for a particular craft, then the ratio shall be one (1) apprentice to every four (4) journeymen.

Comments/Notes

For each craft listed there will be comments/notes that cover the definition of the regular workday, shift differentials, overtime, recognized holidays, and any other relevant information.

Public Works Contractor Registration

The Public Works Contractor Registration Act (N.J.S.A. 34:11-56.48, et seq.) requires that **all** contractors, subcontractors, or lower tier subcontractors who are working on or who bid on public works projects register with the Department of Labor and Workforce Development. Applications are available at *www.nj.gov/labor* (click on Wage & Hour and then go to Registration & Permits).

Pursuant to N.J.S.A. 34:11-56.51:

> *No contractor shall bid on any contract for public work as defined in section 2 of P.L.1963, c. 150 (C.34:11-56.26) unless the contractor is registered pursuant to this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L.1999, c.238 (C.34:11-56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor or subcontractor is registered pursuant to that act*.

Snow Plowing

Snow plowing contracts are <u>not</u> subject to the New Jersey Prevailing Wage Act or the Public Works Contractor Registration Act.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Air Conditioning & Refrigeration - Service and Repair **PREVAILING WAGE RATE**

	03/03/21
Journeyman (Mechanic)	W41.48 B26.57 T68.05

Craft: Air Conditioning & Refrigeration - Service and Repair **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
As Shown	1st Year	2nd Year	3rd Year	4th Year	5th Year	Wage = %	of Jnymn	Wage		
Wage and Bene	40%	50%	60%	70%	80%	Bene = %	of Jnymn	Bene		

Ratio of Apprentices to Journeymen - 1:4

Craft: Air Conditioning & Refrigeration - Service and Repair **COMMENTS/NOTES**

THESE RATES MAY BE USED FOR THE FOLLOWING:
- Service/Repair/Maintenance Work to EXISTING facilities.
- Replacement or Installation of air conditioning and refrigeration equipment when the combined tonnage does not exceed 15 tons for refrigeration, or 25 tons for air conditioning.
- Replacement or Installation of "packaged" or "unitary" rooftop-type units when the combined tonnage of the units does not exceed 75 tons.

NOTE: These rates may NOT be used for any work in new construction (including work on new additions).

The regular workday shall consist of 8 hours, starting between 6:00 AM and 10:00 AM, Monday through Friday.

SHIFT DIFFERENTIALS:
- The second and third shifts shall be paid an additional 15% of the hourly rate.
- All shifts must run for a minimum of 5 consecutive days.

OVERTIME:
Hours worked in excess of 8 per day or before or after the regular workday, that are not shift work, and all hours on Saturday shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Boilermaker **PREVAILING WAGE RATE**

	01/01/21
Foreman	W52.51 B45.60 T98.11
General Foreman	W54.51 B46.63 T101.14
Journeyman	W47.51 B43.91 T91.42

Craft: Boilermaker **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
1000 Hours	65%	70%	75%	80%	85%	90%	95%			
Benefit =	37.08	37.99	39.49	39.84	40.78	41.70	42.61			

Ratio of Apprentices to Journeymen - *

* 1 apprentice will be allowed for the first 5 journeymen, 1 apprentice for the next 10 journeymen and 1 apprentice for each succeeding 20 journeymen up to a maximum of 5 apprentices per contractor on any one job.

Craft: Boilermaker **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE AS OF 1-1-21:

INTERVAL	PERIOD AND RATES						
1000 Hours	65%	70%	75%	80%	85%	90%	95%
Benefits	37.72	38.20	39.20	40.14	41.09	42.03	42.96

HIGH WORK: All apprentices working on the erection, repair, or dismantling of smoke stacks, standpipes, or water towers shall be paid the Journeyman rate.

The regular workday shall consist of 8 hours, between 8:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall work 7½ hours and receive 8 hours pay, at a rate equal to the regular hourly rate plus 10%.
- The third shift shall work 7 hours and receive 8 hours pay, at a rate equal to the regular hourly rate plus 20%.
- For "Municipal Water Works" projects only, the following shall apply: Two, four day, 10 hour shifts may be worked at straight time Monday through Thursday. The day shift shall work four days, at 10 hours, for 10 hours pay. The second shift shall work four days, at nine and a half hours, for 10 hours pay, plus 10% the hourly rate for new work and .25 cents on repair work. Friday may be used as a make-up day at straight time, due to weather conditions, hoilday or any other circumstances beyond the employer's control.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays (except Labor Day) shall be paid at double the hourly rate. All hours on Labor Day shall be paid at four times the hourly rate.

- If any other craft employed by the same contractor, or a subcontractor thereof, receives double time in lieu of time and one-half, then the Boilermaker shall receive double time in lieu of time and one-half.
- For "Municipal Water Works" projects only, the following shall apply: Four 10 hour days may be worked Monday through Thursday at straight time. Friday may be used as a make-up day for a day lost to inclement weather, holiday or other conditions beyond the control of the employer. Overtime shall be paid for any hours that exceed 10 hours per day or 40 hours per week.

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

County - UNION

Craft: Boilermaker - Minor Repairs **PREVAILING WAGE RATE**

	01/01/21
Foreman	W34.62 B17.57 T52.19
General Foreman	W35.25 B17.57 T52.82
Mechanic	W33.25 B17.57 T50.82

Craft: Boilermaker - Minor Repairs **COMMENTS/NOTES**

NOTE: These rates apply to MINOR REPAIR WORK ONLY (repair work in the field for which the contract amount does not exceed $125,000.00), for boilers that do not produce electric or are not used in the heating of petroleum products.

OVERTIME:
Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays (except Labor Day) shall be paid at double the hourly rate. All hours on Labor Day shall be paid at four times the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Thanksgiving Day, day after Thanksgiving, Christmas Day. Saturday holidays observed the preceding Friday, Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Bricklayer, Stone Mason **PREVAILING WAGE RATE**

	05/01/21
Deputy Foreman	W48.20 B33.73 T81.93
Foreman	W51.20 B33.73 T84.93
Journeyman	W45.20 B33.73 T78.93

Craft: Bricklayer, Stone Mason **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	40%	50%	55%	60%	65%	70%	75%	80%		
Benefits	4.00	5.00	5.50	6.00	22.17	23.66	25.14	26.62		

Ratio of Apprentices to Journeymen - 1:5

Craft: Bricklayer, Stone Mason **COMMENTS/NOTES**

The regular workday shall consist of 8 hours, between 6:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- When a 2 shift schedule (including a day shift) is established, the first, or day shift, shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 10%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 10%, inclusive of benefits, and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 10%, inclusive of benefits, and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 10%, inclusive of benefits.

OVERTIME:
- The first 2 hours in excess of 8 per day, or before or after the regular workday that are not shift work, Monday through Friday, shall be paid at time and one-half the regular rate, inclusive of benefits. Any additional overtime shall be paid at double the regular rate, inclusive of benefits. The first 10 hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. Any additional overtime shall be paid at double the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Saturday may be used as a make-up day for hours lost to inclement weather.
- When Bricklayers/Stone Masons work on Saturday with Laborers, and no other crafts are working on the project for the day, benefits may be paid at straight time. If other crafts are present, the applicable overtime rate for benefits shall be paid.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Carpenter **PREVAILING WAGE RATE**

	05/01/21
Foreman	W59.67 B34.56 T94.23
Journeyman	W51.89 B30.12 T82.01

Craft: Carpenter **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	57% of	Appren	tice	Wage Rate	for all	intervals	+ $0.55			

Ratio of Apprentices to Journeymen - 1:3

Craft: Carpenter **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- When there are 2 or more Carpenters on a job, 1 shall be designated as a Foreman.
- When there are 21 or more Carpenters on a job, 2 shall be designated as Foremen.

The regular workday shall consist of 8 hours, starting between 6:00 AM and 9:00 AM.

SHIFT DIFFERENTIALS:
- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 10%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.

OVERTIME:
- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost due to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Carpenter - Resilient Flooring **PREVAILING WAGE RATE**

	05/01/21
Foreman	W59.67 B34.47 T94.14
Journeyman	W51.89 B30.03 T81.92

Craft: Carpenter - Resilient Flooring **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	57%	of	Appren	tice	Wage Rate	for all	intervals	+ $0.46		

Ratio of Apprentices to Journeymen - *

* 1 apprentice shall be allowed to every 2 journeymen or major fraction therof. No more than 3 apprentices on any one job or project.

Craft: Carpenter - Resilient Flooring **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- On any job where there are 4 or more Carpenters of Resilient Flooring, 1 must be designated a Foreman.

FOR SYNTHETIC TURF INSTALLATION ONLY:
- The rate shall be 90% of the wage and benefit rate.

The regular workday consists of 8 hours, starting between 6:00 AM and 9:00 AM.

SHIFT DIFFERENTIALS:
- When a 2 shift schedule (including a day shift) is established, the day shift, shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular wage rate plus 10%.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular wage rate, the second shift shall receive the regular wage rate plus 10% and the third shift shall receive the regular wage rate plus 15%.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular wage rate plus 10% and the third shift shall receive the regular wage rate plus 15%.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.

OVERTIME:
- Hours in excess of 8 per day or 40 per week, or before or after the regular workday, Monday through Friday, shall be paid at time and one-half the wage rate. Saturday may be used as a make-up day, at straight time, up to 8 hours, for hours lost to reasons beyond the control of the employer, up to a total of 40 hours per week; hours in excess of 8 on Saturday shall then be paid at time and one-half the wage rate. If Saturday is not a make-up day, all hours on Saturday shall be paid at time and one-half the wage rate. All hours on Sundays and holidays shall be paid at double the wage rate.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for hours lost to reasons beyond the control of the employer. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the wage rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT
PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Cement Mason **PREVAILING WAGE RATE**

See "Bricklayer, Stone Mason" Rates

Craft: Cement Mason **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									

Ratio of Apprentices to Journeymen - 1:4

Craft: Cement Mason **COMMENTS/NOTES**

See "Bricklayer, Stone Mason" Rates

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Commercial Painter- New Construction **PREVAILING WAGE RATE**

	05/01/21
Foreman	W46.37 B27.61 T73.98
General Foreman	W50.58 B28.10 T78.68
Journeyman	W42.15 B27.11 T69.26

Craft: Commercial Painter- New Construction **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	40%	45%	55%	65%	70%	75%	80%	80%		
Benefits	8.40	8.40	10.40	10.40	11.40	11.40	14.15	14.15		

Ratio of Apprentices to Journeymen - 1:4

Craft: Commercial Painter- New Construction **COMMENTS/NOTES**

* Commercial Painters perform work on all commercial structures such as offices, schools, hotels, shopping malls, restaurants, condominiums, etc.

Spraying, sandblasting, lead abatement work on commercial buildings, work performed above 3 stories or 30 feet in height, or using swing scaffolds requires an additional 10% of the wage rate.

FOREMEN REQUIREMENTS:
- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

OVERTIME:
- Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, General Election Day,

Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Commercial Painter- Repainting **PREVAILING WAGE RATE**

	05/01/21
Foreman	W33.11 B20.66 T53.77
General Foreman	W36.12 B20.66 T56.78
Journeyman	W30.10 B20.66 T50.76

Craft: Commercial Painter- Repainting **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	COMMER	CIAL	PAINTER	NEW	CONSTRUC	TION			

Ratio of Apprentices to Journeymen - 1:4

Craft: Commercial Painter- Repainting **COMMENTS/NOTES**

* Commercial Painters perform work on all commercial structures such as offices, schools, hotels, shopping malls, restaurants, condominiums, etc.

NOTE: These rates may only be used on jobs where no major alterations (only doing painting and carpeting with nothing else being changed in the commercial building) occur, and where not more than 3 other trades are present on the job, but may NOT, under any circumstances, be used for work on bridges, stacks, tanks, or generating stations.

Spraying, sandblasting, lead abatement work on commercial buildings, work performed above 3 stories or 30 feet in height, or using swing scaffolds requires an additional 10% of the wage rate.

FOREMEN REQUIREMENTS:
- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

OVERTIME:
- Hours in excess of 8 per day and 40 per week shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Four 10-hour days may be worked, at straight time, Monday through Sunday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, General Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Diver **PREVAILING WAGE RATE**

	05/07/21
Diver	W60.74 B48.97 T109.71
Tender	W49.00 B48.97 T97.97

Craft: Diver **COMMENTS/NOTES**

NOTE: All dive crews must consist of a Tender, a Diver, and a standby Diver (standby Diver is the same rate as a Diver).

DEPTH & PENETRATION RATES: Divers shall be paid the following depth and penetration rates, in addition to the regular hourly rate, when applicable:

AIR DIVES:
0-59 feet: No additional wage
60-74 feet: + $0.25 per foot
75-125 feet: + $0.78 per foot

MIXED GAS DIVES:
0-74 feet: No additional wage
75-125 feet: + $1.00 per foot
126-200 feet: + $2.00 per foot

PENETRATION DIVES:
126-200 feet: + $1.50 per foot
201-275 feet: + $1.75 per foot
276-350 feet: + $2.00 per foot
351-425 feet: + $2.50 per foot

SHIFT DIFFERENTIAL:
- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis and receive an additional 113% of the wage rate.
- When a three shift schedule is established, all three shifts shall be established on an 8 hour basis, but the second and third shifts shall receive an additional 113% of the wage rate.
- Benefits on shift work shall be paid at the straight-time rate.

OVERTIME:
Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day, Christmas Day. Veterans' Day may be switched with the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Dockbuilder **PREVAILING WAGE RATE**

	05/07/21
Foreman	W56.35 B48.97 T105.32
Foreman (Concrete Form Work)	W55.26 B35.61 T90.87
Journeyman	W49.00 B48.97 T97.97
Journeyman (Concrete Form Work)	W48.05 B35.61 T83.66

Craft: Dockbuilder **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
Yearly	19.60	24.50	31.85	39.20						
Benefit	32.37	for all	intervals							

Ratio of Apprentices to Journeymen - *

* When there are 4 or fewer Dockbuilders on a job, no more than 1 may be an apprentice. When there are 5 or more Dockbuilders, there may be 1 apprentice for every 5 Dockbuilders.

Craft: Dockbuilder **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR CONCRETE FORM WORK ONLY:

INTERVAL PERIOD AND RATES
Yearly 19.22 24.03 31.23 38.44
Benefits 24.34 for all intervals

CREOSOTE HANDLING:
When handling creosote products on land piledriving, floating marine construction, and construction of wharves, the worker shall receive an additional $0.25 per hour.

HAZARDOUS WASTE WORK:
- Hazardous waste removal work on a state or federally designated hazardous waste site where Level A, B, or C personal protection is required: an additional 20% of the hourly rate, per hour.
- Hazardous waste removal work in Level D, or where personal protection is not required: an additional $1.00 per hour.

CERTIFIED WELDER: When required on the job by the project owner, a Certified Welder shall receive an additional $1.00 per hour.

FOREMAN REQUIREMENTS:
The first Dockbuilder on the job shall be designated a Foreman.

SHIFT DIFFERENTIAL:
- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis and receive an additional 113% of the wage rate.
- When a three shift schedule is established, all three shifts shall be established on an 8 hour basis, but the second and third shifts shall receive an additional 113% of the wage rate.
- Benefits on shift work shall be paid at the straight-time rate.

OVERTIME:
Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day, Christmas Day. Veterans' Day may be switched with the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Drywall Finisher **PREVAILING WAGE RATE**

	05/01/21
Foreman	W44.43 B27.68 T72.11
General Foreman	W46.45 B27.68 T74.13
Journeyman	W40.39 B27.68 T68.07

Craft: Drywall Finisher **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
6 Months	40%	50%		60%	70%		80%	90%		
Benefits	Intervals	1 to 2 =	10.75	Intervals	3 to 4 =	13.52	Intervals	5 to 6 =	17.13	

Ratio of Apprentices to Journeymen - 1:4

Craft: Drywall Finisher **COMMENTS/NOTES**

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, and the third shift shall receive 8 hours pay for 7 hours of work.
- Shift work must run for a minimum of 5 consecutive workdays.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician **PREVAILING WAGE RATE**

	05/31/21
Cable Splicer	W64.51 B39.68 T104.19
Foreman (11-20 Journeymen)	W68.62 B42.21 T110.83
Foreman (1-3 Journeymen)	W64.51 B39.68 T104.19
Foreman (4-10 Journeymen)	W67.45 B41.49 T108.94
General Foreman (21-30 Journeymen)	W70.38 B43.29 T113.67
General Foreman (31-60 Journeymen)	W76.24 B46.90 T123.14
General Foreman (61+ Journeymen)	W77.41 B47.62 T125.03
Journeyman	W58.65 B36.08 T94.73
Sub-Foreman	W66.86 B41.13 T107.99

Craft: Electrician **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
Yearly	40%	49%	58%	68%	80%		of Jour	neyman	Wage	Rate
Benefit	40%	49%	58%	68%	80%		of Jour	neyman	Benefit	Rate

Ratio of Apprentices to Journeymen - 2:3

Craft: Electrician **COMMENTS/NOTES**

THESE RATES ALSO APPLY TO THE FOLLOWING:
-All burglar and fire alarm work.
-All fiber optic work.
-Teledata work in new construction.
-Teledata work involving 16 Voice/Data Lines or more.

The regular workday shall be 8 hours, between 8:00 AM and 4:30 PM.

FOREMAN REQUIREMENTS:
- 1 to 3 Journeymen- 1 must be a Foreman (Foreman/1-3 Journeymen rate).
-4 to 10 Journeymen- 1 must be a Foreman (Foreman/4-10 Journeymen rate).
-11 to 20 Journeymen- 1 must be Foreman (Foreman/11-20 Journeymen rate) and 1 must be a Sub-Foreman.
-21 to 30 Journeymen- 1 must be a General Foreman (General Foreman/21-30 Journeymen rate) and 2 must be a Sub-Foreman.
-31 to 40 Journeymen- 1 must be a General Foreman (General Foreman/31-40 Journeymen rate) and 3 must be a Sub-Foreman.
-41 to 50 Journeymen- 1 must be a General Foreman (General Foreman/31-60 Journeymen rate) and 4 must be a Sub-Foreman.
-51 to 60 Journeymen- 1 must be a General Foreman (General Foreman/31-60 Journeymen rate) and 5 must be a Sub-Foreman.
-61+ Journeymen- 1 must be a General Foreman (General Foreman/61+ Journeymen rate) and 6 must be a Sub-Foreman.

SHIFT DIFFERENTIALS:
- Shift work must run for a minimum of 5 consecutive workdays.
- 2nd Shift (4:30 PM to 12:30 AM) shall receive 8 hours pay for 7.5 hours work + an additional 10% of the regular rate, per hour, inclusive of benefits.
- 3rd Shift (12:30 AM to 8:00 AM) shall receive 8 hours pay for 7 hours work + an additional 15% of the regular rate, per hour, inclusive of benefits.

OVERTIME:
Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, and all hours on Saturdays, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician - Teledata (15 Voice/Data Lines & Less) **PREVAILING WAGE RATE**

	11/02/20
Master Technician/General Foreman	W57.42 B31.58 T89.00
Senior Technician/Lead Foreman (21-30 Workers on Job)	W52.56 B28.91 T81.47
Technician A/Foreman (11-20 Workers on Job)	W50.35 B27.69 T78.04
Technician B/Working Foreman (4-10 Workers on Job)	W48.15 B26.47 T74.62
Technician C/Journeyman (1-3 Workers on Job)	W44.17 B24.29 T68.46

Craft: Electrician - Teledata (15 Voice/Data Lines & Less) **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
6 Months					66%	72%	79%	86%		
Benefits					11.81	12.89	14.14	15.40		

Ratio of Apprentices to Journeymen - 2:3

Craft: Electrician - Teledata (15 Voice/Data Lines & Less) **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES ENTERING PROGRAM AFTER 10-31-14:

INTERVAL	PERIOD AND RATES									
6 Months	35%	35%	40%	43%	48%	54%	61%	67%	74%	81%
Benefits	6.76	6.76	7.16	7.70	8.59	9.66	10.82	11.99	13.25	14.51

NOTES:
- These rates are for service, maintenance, moves, and/or changes affecting 15 Voice/Data (teledata) lines or less. These rates may NOT be used for any teledata work in new construction (including additions) or any fiber optic work.
- The number of Teledata workers on the jobsite is the determining factor for which Foreman category applies .

The regular workday shall be 8 hours, between 8:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for a minimum of 5 consecutive workdays.

- 2nd Shift (4:30 PM to 12:30 AM) shall receive 8 hours pay for 7.5 hours work + an additional 10% of the regular rate, per hour, inclusive of benefits.
- 3rd Shift (12:30 AM to 8:00 AM) shall receive 8 hours pay for 7 hours work + an additional 15% of the regular rate, per hour, inclusive of benefits.

OVERTIME:
Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, and all hours on Saturdays, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

County - UNION

Craft: Electrician - Teledata (16 Instruments & More) **PREVAILING WAGE RATE**

See "Electrician" Rates

Craft: Electrician - Teledata (16 Instruments & More) **COMMENTS/NOTES**

See ELECTRICIAN Rates

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician- Outside Commercial **PREVAILING WAGE RATE**

	05/31/21
Cable Splicer	W64.81 B39.38 T104.19
Certified Welder	W61.87 B37.60 T99.47
Equipment Operator	W58.92 B35.80 T94.72
Foreman (1-3 Journeymen workers on job)	W64.81 B39.38 T104.19
Foreman (4-10 Journeymen workers on job)	W67.76 B41.17 T108.93
General Foreman (11-20 Journeymen workers on job)	W68.94 B41.89 T110.83
General Foreman (21-30 Journeymen workers on job)	W70.71 B42.97 T113.68
General Foreman (31-60 Journeymen workers on job)	W76.60 B46.54 T123.14
General Foreman (61+ Journeymen workers on job)	W77.78 B47.26 T125.04
Groundman	W35.35 B21.49 T56.84
Journeyman Lineman/Technician	W58.92 B35.80 T94.72
Sub-Foreman	W67.17 B40.83 T108.00

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician- Outside Commercial **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 Hours	60%	65%	70%	75%	80%	85%	90%			
Benefits	60.75% of	Journey	man	wage	+ $.01					

Craft: Electrician- Outside Commercial **COMMENTS/NOTES**

* FOR UTILITY WORK PLEASE SEE STATEWIDE RATES

The regular worday shall be 8 hours, between 8:00 AM and 4:30 PM.

FOREMAN REQUIREMENTS:
- 1 to 3 Journeymen- 1 must be a Foreman (Foreman/1-3 Journeymen rate).
-4 to 10 Journeymen- 1 must be a Foreman (Foreman/4-10 Journeymen rate).
-11 to 20 Journeymen- 1 must be Foreman (Foreman/11-20 Journeymen rate) and 1 must be a Sub-Foreman.
-21 to 30 Journeymen- 1 must be a General Foreman (General Foreman/21-30 Journeymen rate) and 2 must be a Sub-Foreman.
-31 to 40 Journeymen- 1 must be a General Foreman (General Foreman/31-40 Journeymen rate) and 3 must be a Sub-Foreman.
-41 to 50 Journeymen- 1 must be a General Foreman (General Foreman/31-60 Journeymen rate) and 4 must be a Sub-Foreman.
-51 to 60 Journeymen- 1 must be a General Foreman (General Foreman/31-60 Journeymen rate) and 5 must be a Sub-Foreman.
-61+ Journeymen- 1 must be a General Foreman (General Foreman/61+ Journeymen rate) and 6 must be a Sub-Foreman.

SHIFT DIFFERENTIALS:
Shift work must run for a minimum of 5 consecutive workdays.
2nd Shift (4:30 PM to 12:30 AM): 8 hrs. pay for 7.5 hrs. work + an additional 10% of the regular rate, inclusive of benefits.
3rd Shift (12:30 AM to 8:00 AM): 8 hrs. pay for 7 hrs. work + an additional 15% of the regular rate per hour, inclusive benefits.

OVERTIME:
Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, and all hours on Saturdays, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS:
New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day and Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician-Utility Work (North) **PREVAILING WAGE RATE**

Rates are located in the "Statewide" rate package

Craft: Electrician-Utility Work (North) **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
* 6 Months	60%	65%	70%	75%	80%	85%	90%			
Benefits	69% of	Appren	tice	Wage	Rate	for all	intervals			

Craft: Electrician-Utility Work (North) **COMMENTS/NOTES**

Electrician-Utility Work (North) rates are located in the "Statewide" rate package.

* The apprentice wage rate is paid at the percentage of the Journeyman Lineman wage rate located in the "Statewide" rate package.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT
PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Electrician-Utility Work (South) **PREVAILING WAGE RATE**

Rates are located in the "Statewide" rate package

Craft: Electrician-Utility Work (South) **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	29.70	32.18	34.65	37.13	39.60	42.08	44.55			
Benefits	26.19	27.65	29.10	30.58	32.04	33.51	34.95			

Craft: Electrician-Utility Work (South) **COMMENTS/NOTES**

Electrician-Utility Work (South) rates are located in the "Statewide" rate package.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Elevator Constructor **PREVAILING WAGE RATE**

	03/17/21	03/17/22	03/17/23
Journeyman	W72.29 B42.92 T115.21	W75.14 B43.91 T119.05	W77.49 B45.57 T123.06

Craft: Elevator Constructor **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	29.85	36.82	43.52	50.21						
Benefits	32.71	33.51	34.80	36.09						

Ratio of Apprentices to Journeymen - 1:1

Craft: Elevator Constructor **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE AS OF 3-17-20:
INTERVAL PERIOD AND RATES
Yearly 31.03 38.26 45.21 52.17
Benefits 33.38 34.20 35.55 36.89

APPRENTICE RATE SCHEDULE AS OF 3-17-21:
INTERVAL PERIOD AND RATES
Yearly 32.27 39.76 46.99 54.22
Benefits 34.05 34.91 36.30 37.70

APPRENTICE RATE SCHEDULE AS OF 3-17-22:
INTERVAL PERIOD AND RATES
Yearly 33.56 41.33 48.84 56.36
Benefits 34.72 35.61 37.05 38.50

APPRENTICE RATE SCHEDULE AS OF 3-17-23:
INTERVAL PERIOD AND RATES
Yearly 34.60 42.62 50.37 58.12
Benefits 36.02 36.94 38.50 39.95

The regular workday shall consist of either 7 or 8 hours to be established at the beginning of the project, between 7:00 AM and 4:30 PM.

OVERTIME:
For all hours worked before or after the regular workday, Monday through Friday, and all hours on Saturday and Sunday , shall be paid at double the hourly rate. Holiday pay is one days wages (8 hours) plus double the hourly rate for all hours worked.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus

Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays shall be observed on the previous Friday and Sunday holidays shall be observed on the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Elevator Modernization & Service **PREVAILING WAGE RATE**

	03/17/21	03/17/22	03/17/23
Journeyman	W56.77 B41.82 T98.59	W59.09 B42.79 T101.88	W60.89 B44.41 T105.30

Craft: Elevator Modernization & Service **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	29.85	28.84	34.09	39.33						
Benefits	32.66	33.13	34.36	35.58						

Ratio of Apprentices to Journeymen - 1:1

Craft: Elevator Modernization & Service **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE AS OF 3-17-20:
INTERVAL PERIOD AND RATES
Yearly 31.03 30.01 35.46 40.92
Benefits 33.33 33.82 35.09 36.36

APPRENTICE RATE SCHEDULE AS OF 3-17-21:
INTERVAL PERIOD AND RATES
Yearly 32.27 31.22 36.90 42.58
Benefits 34.00 34.50 35.83 37.15

APPRENTICE RATE SCHEDULE AS OF 3-17-22:
INTERVAL PERIOD AND RATES
Yearly 33.56 32.50 38.41 44.32
Benefits 34.67 34.20 35.20 37.94

APPRENTICE RATE SCHEDULE AS OF 3-17-23:
INTERVAL PERIOD AND RATES
Yearly 34.60 33.49 39.58 45.67
Benefits 35.97 36.53 37.95 39.38

MODERNIZATION (addition, replacement, refurbishing, relocation, or changes in design or appearance, of elevator equipment in existing buildings):

- The regular workday consists of 8 hours, between 7:00 AM and 4:30 PM.

- Overtime:
Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturday and Sunday shall be paid at time and one-half the hourly rate. Holiday pay is one days wages (8 hours) plus time and one-half the hourly rate for all hours worked.

SERVICE (repair or replacement of parts for the purpose of maintaining elevator equipment in good operating condition):

- The regular workday consists of 8 hours, between 6:00 AM and 6:00 PM.

- Overtime:
Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS (Modernization and Service): New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays shall be observed on the previous Friday and Sunday holidays shall be observed on the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Glazier **PREVAILING WAGE RATE**

	05/07/21
* Leadman	W50.50 B27.86 T78.36
Foreman	W52.50 B28.10 T80.60
General Foreman	W54.50 B28.34 T82.84
Journeyman	W48.50 B27.62 T76.12

Craft: Glazier **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
6 Months	50%	55%	60%	65%	70%	75%	80%	90%		
Benefits	9.75	9.75	12.36	12.36	13.60	13.60	17.02	17.02		

Ratio of Apprentices to Journeymen - 1:4

Craft: Glazier **COMMENTS/NOTES**

Hazard/Height Pay: +$1.00 per hour

* When there are three (3) men working on a jobsite for three (3) days or longer, 1 Journeyman may be designated as a Leadman for the duration of the job, provided he has his OSHA certification.

FOREMAN REQUIREMENTS:
- When there are 4 or more Glaziers on a job, 1 must be designated a Foreman.
- When there are 15 or more Glaziers on a job, 1 must be designated a General Foreman.

The regular workday shall consist of 8 hours, between 7:00 AM and 5:30 PM, Monday to Friday.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, and the third shift shall receive 8 hours pay for 7 hours of work.

OVERTIME:
Hours in excess of 8 per day, or before or after the regular workday Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular

rate.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, General Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Heat & Frost Insulator **PREVAILING WAGE RATE**

	09/21/20
Foreman	W58.52 B33.42 T91.94
General Foreman	W60.86 B34.53 T95.39
Journeyman	W56.74 B32.86 T89.60

Craft: Heat & Frost Insulator **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	26.55	31.49	37.95	44.36						
Benefits	19.44	23.03	25.44	27.76						

Ratio of Apprentices to Journeymen - 1:3

Craft: Heat & Frost Insulator **COMMENTS/NOTES**

NOTE: These rates apply to the installing of insulation on hot and cold mechanical systems.

The regular workday shall be 8 hours between 7:00 AM and 3:30 PM. In addition, the regular workday may also be 8 hours between 6:00 AM and 2:30 PM.

SHIFT DIFFERENTIAL:
- Shift work must run for a minimum of 5 consecutive workdays.
- Second Shift shall work 7.5 hours and receive 8 hours pay, at the regular rate, plus 25% per hour.
- Third Shift shall work 7 hours and receive 8 hours pay, at the regular rate, plus 30% per hour.

OVERTIME:
The first 2 hours in excess of 8 per day, hours outside of the regular workday Monday through Friday that are not shift work, and the first 10 hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours in excess of 10 per day, and all hours on Sunday and holidays (except Labor Day) shall be paid at double the regular rate, inclusive of benefits. All hours on Labor Day shall be paid at triple the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day and Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Heat & Frost Insulator - Asbestos Worker **PREVAILING WAGE RATE**

	09/24/19
Asbestos Helper Abatement	W36.89 B24.92 T61.81

Craft: Heat & Frost Insulator - Asbestos Worker **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	HEAT &	FROST	INSULATOR						

Ratio of Apprentices to Journeymen - 1:3

Craft: Heat & Frost Insulator - Asbestos Worker **COMMENTS/NOTES**

NOTE: These rates apply only to the removal of insulation materials/asbestos from mechanical systems, including containment erection and demolition, and placing material in appropriate containers.

The regular workday shall be 8 hours between 7:00 AM and 3:30 PM. In addition, the regular workday may also be 8 hours between 6:00 AM and 2:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for a minimum of 5 consecutive workdays.
- The second shift shall work 7.5 hours and receive 8 hours pay at the regular rate, plus 25% per hour.
- The third shift shall work 7 hours and receive 8 hours pay at the regular rate, plus 30% per hour.

OVERTIME: The first 2 hours in excess of 8 per day, hours outside of the regular workday Monday through Friday that are not shift work, and the first 10 hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours in excess of 10 per day, and all hours on Sunday and holidays (except Labor Day) shall be paid at double the regular rate, inclusive of benefits. All hours on Labor Day shall be paid at triple the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day and Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Industrial Painter- Bridges **PREVAILING WAGE RATE**

	02/11/21
Foreman	W62.18 B31.62 T93.80
General Foreman	W64.18 B31.62 T95.80
Journeyman	W57.18 B31.62 T88.80

Craft: Industrial Painter- Bridges **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	60%	70%	80%	90%						
Benefits	14.27	14.50	17.73	17.96						

Ratio of Apprentices to Journeymen - 1:4

Craft: Industrial Painter- Bridges **COMMENTS/NOTES**

* Industrial Painters perform work on all industrial structures, such as bridges, water tanks, waste water facilitites , refineries, any structural steel work, etc.

These rates apply to: All bridges that span waterways, roadways, railways and canyons. All tunnels, overpasses, viaducts and all appurtenances.

FOREMEN REQUIREMENTS:
- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday

observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Industrial Painter- Structural Steel **PREVAILING WAGE RATE**

	02/11/21
Foreman	W50.92 B29.27 T80.19
General Foreman	W52.92 B29.27 T82.19
Journeyman	W45.92 B29.27 T75.19

Craft: Industrial Painter- Structural Steel **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	INDUST	RIAL	PAINTER	BRIDGES					

Ratio of Apprentices to Journeymen - 1:4

Craft: Industrial Painter- Structural Steel **COMMENTS/NOTES**

* Industrial Painters perform work on all industrial structures, such as bridges, water tanks, waste water facilitites , refineries, any structural steel work, etc.

These rates apply to: All work in power plants (any aspect). On steeples, on dams, on hangers, transformers, substations, on all open steel, in refineries, tank farms, water/sewerage treatment facilities and on pipelines.

FOREMEN REQUIREMENTS:
- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Industrial Painter- Water Tanks **PREVAILING WAGE RATE**

	02/11/21
Foreman	W51.97 B28.92 T80.89
General Foreman	W53.97 B28.92 T82.89
Journeyman	W46.97 B28.92 T75.89

Craft: Industrial Painter- Water Tanks **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	50%	70%	90%							
Benefits	11.77	14.50	17.96							

Ratio of Apprentices to Journeymen - 1:4

Craft: Industrial Painter- Water Tanks **COMMENTS/NOTES**

* Industrial Painters perform work on all industrial structures, such as bridges, water tanks, waste water facilitites , refineries, any structural steel work, etc.

These rates apply to: All new and repaint water tanks (interior and exterior).

FOREMEN REQUIREMENTS:
- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Industrial Painter-Containment **PREVAILING WAGE RATE**

	02/11/21
Journeyman	W38.23 B28.67 T66.90

Craft: Industrial Painter-Containment **COMMENTS/NOTES**

Note: These rates shall require no painting, but used in a supporting capacity only, such as wrapping, boxing, fencing, etc. on tanks.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, and the third shift shall receive 8 hours pay for 7 hours of work.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Ironworker **PREVAILING WAGE RATE**

	07/08/21
Rod /Fence Foreman	W47.14 B48.17 T95.31
Rod/Fence Journeyman	W44.14 B48.17 T92.31
Structural Foreman	W49.44 B48.17 T97.61
Structural Journeyman	W46.44 B48.17 T94.61

Craft: Ironworker **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
6 Months	50%	60%		Yearly	70%	80%	90%			

Ratio of Apprentices to Journeymen - 1:4

Craft: Ironworker **COMMENTS/NOTES**

HAZARDOUS WASTE WORK: On hazardous waste removal work on a state or federally designated hazardous waste site where the Ironworker is required to wear Level A,B, or C personal protection: + $3.00 per hour

The regular workday consists of 8 hours between 6:00 AM and 4:30 PM.

FOREMAN REQUIREMENTS:
When there are 2 or more Ironworkers on a job, 1 shall be designated a Foreman.

SHIFT DIFFERENTIALS:
- When a 2 shift schedule is established, the first, or day shift , shall be established on an 8 hour basis .The second shift shall be established on an 8 hour basis, and receive the regular rate plus 15%.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 15%, and the third shift shall receive the regular rate plus 20%.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis.
- When an irregular shift is established for the Ironworker (Structural) classification, the rate shall be paid at time and one-half the regular rate, inclusive of benefits. When an irregular shift is established for the Rod /Fence classification, the shift shall be established on an 8 hour basis and receive the regular rate, plus 20%.

OVERTIME:

- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the hourly rate, inclusive of benefits. Saturday may be used as a make-up day for a day lost to inclement weather. If Saturday is not a make-up day, all hours on Saturday shall be paid at time and one-half the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Laborer - Asbestos & Hazardous Waste Removal **PREVAILING WAGE RATE**

	10/20/20
Journeyman (Handler)	W32.98 B23.66 T56.64

Craft: Laborer - Asbestos & Hazardous Waste Removal **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	19.79	23.09	26.38	29.68						
Benefits	21.51	for	all	intervals						

Ratio of Apprentices to Journeymen - *

* Ratio of apprentices to journeymen shall not be more than one apprentice for the first journeyman and no more than (1) apprentice for each additional three (3) journeymen.

Craft: Laborer - Asbestos & Hazardous Waste Removal **COMMENTS/NOTES**

NOTE: These rates apply to work in connection with Asbestos, Radiation, Hazardous Waste, Lead, Chemical, Biological, Mold Remediation and Abatement.

The regular workday shall be 8 hours.

OVERTIME:
- Hours in excess of 8 per day, Monday through Saturday, and all hours on Sunday and holidays shall be paid at time and one-half the regular rate.
- Benefits on ALL overtime hours shall be paid at straight time.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Easter, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. (Holidays start at 12:00 am).

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Laborer - Building **PREVAILING WAGE RATE**

	05/07/21
Class A Journeyman	W35.25 B30.62 T65.87
Class B Journeyman	W34.50 B30.62 T65.12
Class C Journeyman	W29.33 B30.62 T59.95
Foreman	W39.66 B30.62 T70.28
General Foreman	W44.06 B30.62 T74.68

Craft: Laborer - Building **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
6 Months	60%	70%	80%	90%						
Benefit	27.37	27.37	27.37	27.37						

Ratio of Apprentices to Journeymen - *

* Ratio of apprentices to journeymen shall not be more than one apprentice for the first journeyman and no more than (1) apprentice for each additional three (3) journeymen.

Craft: Laborer - Building **COMMENTS/NOTES**

CLASS A: Specialist laborer including mason tender or concrete pour crew; scaffold builder (scaffolds up to 14 feet in height); operator of forklifts, Bobcats (or equivalent machinery), jack hammers, tampers, motorized tampers and compactors, vibrators, street cleaning machines, hydro demolition equipment, riding motor buggies, conveyors, burners; and nozzlemen on gunite work.
CLASS B: Basic laborer - includes all laborer work not listed in Class A or Class C.
CLASS C: Janitorial-type light clean-up work associated with the TURNOVER of a project, or part of a project, to the owner. All other clean-up work is Class B.

The regular workday shall be 8 hours between 6:00 AM and 6:00 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for a minimum of 5 consecutive workdays.
- When a 2-shift schedule is worked, including a day shift, both shifts shall be established on the basis of 8 hours pay for 8 hours worked. The second shift shall receive the regular rate plus an additional 10%.
- When a 3-shift schedule is worked, the day shift shall be established on the basis of 8 hours pay for 8 hours worked, the second shift shall be established on the basis of 8 hours pay for 7.5 hours worked, and the third shift shall be established

on the basis of 8 hours pay for 7 hours worked. The day shift shall receive the regular rate, the second shift shall receive the regular rate plus an additional 10%, and the third shift shall receive the regular rate plus an additional 15%.
- When a second or third shift is worked with no day shift, the second or third shift shall be established on the basis of 8 hours pay for 8 hours worked. The second shift shall receive the regular rate plus an additional 10%, and the third shift shall receive the regular rate plus an additional 15%.

OVERTIME:
- Hours in excess of 8 per day, or outside the regular workday that are not shift work, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. Saturday may be used as a make-up day (paid at straight time) for a day lost to inclement weather, or for a holiday that is observed during the work week, Monday through Friday. All hours on Sundays and holidays shall be paid at double the regular rate.
- Four 10-hour days may be worked Monday to Thursday, at straight time, with Friday used a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the regular rate.
- Benefits on ALL overtime hours shall be paid at time and one-half.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Laborer - Heavy & General **PREVAILING WAGE RATE**

Rates are located in the
"Statewide" rate package

Craft: Laborer - Heavy & General **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 Hours	60%	70%	80%	90%						
Benefit	22.48	for	all	intervals						

Ratio of Apprentices to Journeymen - *

* No more than 1 apprentice for the first journeyman and no more than 1 apprentice for each additional 3 journeymen.

Craft: Laborer - Heavy & General **COMMENTS/NOTES**

Heavy & General Laborer rates are located in the "Statewide" rate package.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Laborer-Residential and Modular Construction **PREVAILING WAGE RATE**

	04/01/20
* Skilled Tradesman (only applies to Modular Construction)	W26.55 B5.45 T32.00
Foreman (person directing crew, regardless of his skill classification)	W30.55 B5.45 T36.00
Laborer	W22.55 B5.45 T28.00
Laborer (for single family and stand-alone duplex owned by single owner)	W17.05 B2.95 T20.00

Craft: Laborer-Residential and Modular Construction **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
As shown	800 hours	600 hours	600 hours							
wage & benefits	70%	80%	90%							

Ratio of Apprentices to Journeymen-

One (1) apprentice shall be allowed for the first journeyman on site and no more than one (1) additional apprentice for each additional three (3) journeymen on site.

Craft: Laborer-Residential and Modular Construction **COMMENTS/NOTES**

* SKILLED TRADESMAN-
any worker doing work not typically done by a Building Laborer. Some examples are installing interior doors, sheet rock, hooking up appliances, installing light fixtures, installing railing systems, etc. Please note where local building codes require that certain work be performed under the supervision of a licensed tradesman (i.e. Plumber, Electrician, etc.) Laborers shall work under such supervision.

RESIDENTIAL CONSTRUCTION- All residential construction (not commercial), single-family, stand-alone duplex houses, townhouses and multi-family buildings of not more than four (4) floors. Each housing unit must be fully and independently functional; each housing unit must have its own kitchen and bathroom. The definition includes all incidental items such as site work, parking areas, utilities, streets and sidewalks. Please note the construction must be Residential in nature. A First Floor at or below grade may contain commercial space not to exceed 50% square footage of the floor; at least 50% of the First Floor must contain living accommodations or related nonresidential uses (e.g. laundry space, recreation/hobby rooms, and/or corridor space). Basement stories below grade used for storage, parking, mechanical systems/equipment, etc., are considered basement stories which are not used in determining the building's height. An attic is an unfinished space located immediately below the roof. Such space is not used in determining a building's height even if used for storage purposes. In addition, barracks and dormitories are not considered residential projects.

MODULAR RESIDENTIAL CONSTRUCTION- all aspects of modular residential construction (not commercial) at the site of installation of structures of no more than four (4) stories, including all excavation and site preparation, footings and

foundation systems whether poured on-site or prefabricated, all underground waterproofing, underground utilities, concrete slabs, sidewalks, driveways, paving, hardscape and landscaping. Please note the construction must be Residential as defined above. All work performed by the Set Crew (the crew of workers who set the modular boxes on the foundation), including the rigging, setting, attaching and assembly of all modules and structural members, preparation of the foundation to accept modules, such as sill plates, connection of all in-module and under-module connections including, but not limited to, plumbing, electrical, HVAC, fire suppression, CATS, telephone, television/internet, and fiber optic, the building or installation of any porches or decks regardless of material or method of construction, the on-site installation of, or completion of any roof system, doors, windows and fenestrations, including flashing, gutter and soffit systems, waterproofing, insulation and interior and exterior trim work, and painting. Please note that modular construction does not include on-site stick built construction, tip up construction or panel built construction.

The regular workday shall be 8 hours between 6:00 AM and 6:00 PM.

OVERTIME:
Hours worked in excess of 8 per day/40 per week, Monday through Saturday, and all hours worked on Sunday and holidays shall be paid at time and one-half the hourly rate.

RECOGNIZED HOILDAYS:
New Year's Day, Martin Luther King Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Millwright **PREVAILING WAGE RATE**

	05/01/21
Foreman	W59.87 B35.32 T95.19
Journeyman	W52.06 B30.79 T82.85

Craft: Millwright **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	40%	55%	65%	80%	90%					
Benefits	58% of	Appren	tice	Wage	Rate	for all	intervals	+ $.60		

Ratio of Apprentices to Journeymen - 1:3

Craft: Millwright **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- When there are 2 or more Millwrights on a job, 1 shall be designated as a Foreman.

The regular workday shall consist of 8 hours, starting between 6:00 AM and 9:00 AM.

SHIFT DIFFERENTIALS:
- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 15%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 15% and the third shift shall receive the regular rate plus 20%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 15% and the third shift shall receive the regular rate plus 20%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.

OVERTIME:
- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost due to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Operating Engineer **PREVAILING WAGE RATE**

Rates are located in the
"Statewide" rate package

Craft: Operating Engineer **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	60%	70%	80%	90%						

Ratio of Apprentices to Journeymen - *

* 1 apprentice for each piece of heavy equipment. At least 10 pieces of heavy equipment or a minimum of 5 Operating Engineers must be on site.

Craft: Operating Engineer **COMMENTS/NOTES**

Operating Engineer rates are located in the "Statewide" rate package.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Operating Engineer - Field Engineer **PREVAILING WAGE RATE**

Rates are located in the
"Statewide" rate package

Craft: Operating Engineer - Field Engineer **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	70%	75%	of Rod/	Chainman	Wage					
Yearly			80%	90%	Transit/	Instrument	man	Wage		

Ratio of Apprentices to Journeymen - *

* No more than 1 Field Engineer Apprentice per Survey Crew.

Craft: Operating Engineer - Field Engineer **COMMENTS/NOTES**

Operating Engineer - Field Engineer rates are located in the "Statewide" rate package.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Painter - Line Striping **PREVAILING WAGE RATE**

	12/10/20
Apprentice (1st year)	W27.50 B12.15 T39.65
Apprentice (2nd year)	W31.50 B23.10 T54.60
Foreman (Charge Person)	W40.15 B23.88 T64.03
Journeyman 1 (at least 1 year of working exp. as a journeyman)	W35.38 B23.88 T59.26
Journeyman 2 (at least 2 years of working exp. as a journeyman)	W39.15 B23.88 T63.03

Craft: Painter - Line Striping **COMMENTS/NOTES**

OVERTIME:
Hours in excess of 8 per day, Monday through Saturday, and all hours on Sundays and holidays shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day and Christmas Day. Veterans Day may be substituted for the day after Thanksgiving.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Paperhanger **PREVAILING WAGE RATE**

	05/01/21
Foreman	W47.34 B27.22 T74.56
Journeyman	W43.04 B27.22 T70.26

Craft: Paperhanger **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	COMMER	CIAL	PAINTER	NEW	CONSTR	UCTION			

Craft: Paperhanger **COMMENTS/NOTES**

FOREMEN REQUIREMENTS:
- When there are 4 or more Paperhangers on a job, 1 shall be designated a Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:
- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, General Election Day, Veterans' Day, Thanksgiving Day, Christmas Day

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Pipefitter **PREVAILING WAGE RATE**

	05/05/21
Foreman	W57.98 B48.22 T106.20
Journeyman	W52.23 B43.45 T95.68

Craft: Pipefitter **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	35%	45%	55%	65%	75%					
Benefit	23.27	26.00	28.69	31.42	34.14					

Ratio of Apprentices to Journeymen - 1:5

Craft: Pipefitter **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- When there are 2 or more Journeyman Pipefitters on a job, 1 shall be designated a Foreman.
- There shall be a Foreman for every 8 Journeyman Pipefitters on a job.

The regular workday shall be 8 hours between 7:00 AM and 3:30 PM.

SHIFT DIFFERENTIAL:
- 2nd Shift (3:30 PM-11:30 PM) shall work 7.5 hours and receive 8 hours pay at the regular rate, plus 10% per hour on the total rate.
- 3rd Shift (11:30 PM-7:00 AM) shall work 7 hours and receive 8 hours pay at the regular rate, plus 15% per hour on the total rate.

OVERTIME:
- All hours worked in excess of 8 per day, Monday through Friday, and all hours worked on Saturday, shall be paid at time and one-half, inclusive of benefits. All hours on Sunday and holidays shall be paid at double time, inclusive of benefits.
- By mutual agreement, employees may work four 10-hour days, Monday to Thursday, at straight time rate. Friday may be used as a make-up day for a day lost to inclement weather, and may be paid at straight time. If Friday is not a make-up day, the first 8 hours shall be paid at time and one-half, inclusive of benefits; hours in excess of 8 shall be paid at double time, inclusive of benefits.

SHIFT DIFFERENTIAL (Maintenance Work Only):
- 2nd Shift (3:30 PM-11:30 PM) shall work 7.5 hours and receive 8 hours pay at the regular rate, plus 10% per hour on the total rate.
- 3rd Shift (11:30 PM-7:00 AM) shall work 7 hours and receive 8 hours pay at the regular rate, plus 15% per hour on the total rate.

OVERTIME (Maintenance Work Only):
- All hours in excess of 8 per day, Monday through Saturday, shall be paid at time and one-half, inclusive of benefits. All

hours on Sundays and holidays shall be paid at double time, inclusive of benefits.

NOTE: Maintenance work is work to repair, restore, or improve the efficiency of existing facilities. This does NOT apply to ANY new construction.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays are observed the following Monday.

County - UNION

Craft: Plasterer **PREVAILING WAGE RATE**

See Bricklayer, Stone Mason Rates

Craft: Plasterer **COMMENTS/NOTES**

See BRICKLAYER, STONE MASON Rates

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Plumber **PREVAILING WAGE RATE**

	05/05/21
Foreman	W61.77 B38.82 T100.59
General Foreman	W65.77 B38.82 T104.59
Journeyman	W57.19 B38.82 T96.01

Craft: Plumber **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	30%	45%	55%	65%	75%					
Benefits	16.17	22.06	23.99	25.95	27.87					

Ratio of Apprentices to Journeymen - *

* Employers may employ 1 apprentice on any job where 1 or 2 journeymen are employed. Thereafter, 1 apprentice may be employed for every 4 journeymen.

Craft: Plumber **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- On any job having 2 or more Plumbers, 1 must be designated a Foreman.
- On any job having 9 or more Plumbers, 2 shall be designated as Foremen.

The regular workday shall consist of 8 hours between 7:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must continue for a minimum of 5 consecutive workdays.
- When two shifts are worked, the second shift shall work 7.5 hours and receive 8 hours pay, at a rate equal to the hourly rate plus 10%, inclusive of benefits.
- When a third shift is worked, the third shift shall work 7 hours and receive 8 hours pay, at a rate equal to the hourly rate plus 15%, inclusive of benefits.

OVERTIME:
- All hours in excess of 8 per day, or before of after the regular workday that are not shift work, Monday through Friday, and all hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays, shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost due to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Roofer **PREVAILING WAGE RATE**

	06/29/21
Foreman	W44.27 B28.81 T73.08
Journeyman	W41.27 B28.81 T70.08

Craft: Roofer **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	16.50	20.63	24.76	26.82	28.89	30.95	33.01	37.14		
Benefits	2.16	2.16	26.06	26.06	26.06	26.06	26.06	26.06		

Ratio of Apprentices to Journeymen - *

* A) For roofing jobs that are of the 1 or single ply nature: 1:2 or fraction thereof
B) For roofing jobs on new built up roofs: 1:3 or fraction thereof
C) For roofing jobs that are of a tear-off nature: 1:2 or fraction thereof
D) For roofing jobs {not requiring complete removal of existing systems, installation done over existing roof}: 1:3 or fraction thereof

Craft: Roofer **COMMENTS/NOTES**

Pitch: +.50 per hour

Mop Man: +.30 per hour

The regular workday consists of 8 hours between 8:00 AM and 4:30 PM.

OVERTIME:
Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays, Sundays, and holidays shall be paid at time and one-half the regular rate.

RECOGNIZED HOLIDAYS: New Year's Day, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Sheet Metal Sign Installation **PREVAILING WAGE RATE**

	04/05/21
Foreman	W39.79 B37.29 T77.08
Journeyman	W38.04 B37.29 T75.33

Craft: Sheet Metal Sign Installation **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 hours	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
Benefits	12.61	14.38	16.14	17.92	20.14	21.94	23.75	25.58	27.38	29.18

Ratio of Apprentices to Journeymen - 1:3

Craft: Sheet Metal Sign Installation **COMMENTS/NOTES**

FOREMAN REQUIREMENT:
When there are 6 or more Sheet Metal Sign Installers on a job, 1 shall be designated a Foreman.

The regular workday consists of 8 hours, between 7:00 AM and 3:30 PM.

OVERTIME:
Hours before or after the regular workday, Monday though Friday, and all hours worked on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

Four(4) 10 hour days may be worked, Monday through Friday, at straight time, for projects lasting at least one week in duration. The fifth day may be used as a make-up day at straight time for a day lost due to inclement weather. However, if the fifth day is not a make-up day, all hours worked will be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays observed the preceding Friday, Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Sheet Metal Worker **PREVAILING WAGE RATE**

	06/29/21
Foreman	W54.85 B48.17 T103.02
General Foreman	W55.85 B48.17 T104.02
Journeyman	W51.35 B48.17 T99.52

Craft: Sheet Metal Worker **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
Yearly	35%	45%	55%	65%	of	Journey	man	Wage	Rate	
Benefit	35%	45%	55%	65%	of	Journey	man	Benefit	Rate	

Ratio of Apprentices to Journeymen - 1:4

Craft: Sheet Metal Worker **COMMENTS/NOTES**

FOREMAN REQUIREMENTS:
- When there are 2 or more Sheet Metal Workers on a project, 1 must be designated a Foreman.
- When there are 17 or more Sheet Metal Workers on a project, 1 must be designated a General Foreman.
- When there is only 1 Sheet Metal Worker (1 Journeyman) on a project, he/she shall receive $1.00 more than the regular Journeyman's rate.

The regular workday is 8 hours between 7:00 AM and 4:30 PM.

SHIFT DIFFERENTIAL:
- 2nd Shift (3:30 PM - 12:00 AM) : +17% of regular hourly rate
- Shift work must run for a minimum of 5 consecutive workdays.

OVERTIME:
- Hours in excess of 8 per day, or before or after the regular workday, that are not shift work, and the first 10 hours on Saturdays shall be paid at time and one-half of the regular rate, inclusive of benefits. Hours in excess of 10 per day on Saturday, and all hours on Sundays and holidays shall be at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Friday, at straight time, with hours in excess of 10 per day, and hours in excess of 40 per week paid at the overtime rates listed above.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Sprinkler Fitter **PREVAILING WAGE RATE**

	06/29/21
Foreman	W68.17 B33.65 T101.82
General Foreman	W71.59 B33.65 T105.24
Journeyman	W63.92 B33.65 T97.57

Craft: Sprinkler Fitter **APPRENTICE RATE SCHEDULE**

INTERVAL	**PERIOD AND RATES**									
1000 Hours									80%	85%
Benefits							Intervals	9 to 10	Jourymn	Ben.

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES REGISTERED AS OF 7-1-13:

INTERVAL	PERIOD AND RATES									
1000 hours	25%	30%	40%	45%	55%	60%	70%	75%	85%	90%
Benefits	12.65	12.65	26.65	26.65	26.65	26.65	Intervals 7 to 10 receive Journeyman Ben.			

Craft: Sprinkler Fitter **COMMENTS/NOTES**

The regular workday consists of 8 consecutive hours between 6:00 AM and 4:30 PM.

FOREMAN REQUIREMENTS:
- The first Sprinkler Fitter on the job must be designated a Foreman.
- On any job having 12 or more Sprinkler Fitters, one must be designated a General Foreman.

SHIFT DIFFERENTIALS:
- Shift work must run for a minimum of 2 consecutive workdays.
- 2nd and 3rd shift shall receive an additional 15% of the regular rate, per hour.
- Any "off hours" shift starting at 8:00 PM or later shall receive an additional 25% of the regular rate, per hour.

OVERTIME:
The first 2 hours in excess of 8 per day, after the regular workday that are not shift work, Monday through Friday, shall be paid at time and one-half the regular rate. Hours worked in excess of 10 per day, Monday through Friday, and all hours on Saturday, Sunday and holidays, shall be paid double the regular rate.
Four 10 hour days may be worked, Monday through Friday, at straight-time.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Tile Finisher-Marble **PREVAILING WAGE RATE**

	07/05/21
Finisher	W48.87 B35.40 T84.27

Craft: Tile Finisher-Marble **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	40%	45%	50%	55%	60%	65%	70%	75%	85%	95%

Ratio of Apprentices to Journeymen - 1:4

Craft: Tile Finisher-Marble **COMMENTS/NOTES**

OVERTIME:
Hours in excess of 7 per day, Monday through Friday, and the first 7 hours on Saturdays shall be paid at time and one half the regular rate, inclusive of benefits. Hours in excess of 7 on Saturdays and all hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Tile Setter - Ceramic **PREVAILING WAGE RATE**

	07/01/21
Finisher	W46.89 B31.85 T78.74
Setter	W61.07 B35.02 T96.09

Craft: Tile Setter - Ceramic **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	35%	40%	50%	55%	60%	65%	70%	75%	80%	90%

Ratio of Apprentices to Journeymen - 1:4

Craft: Tile Setter - Ceramic **COMMENTS/NOTES**

OVERTIME:
Hours in excess of 7 per day, and the first 10 hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Saturdays after 10 hours shall be paid double the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Tile Setter - Marble **PREVAILING WAGE RATE**

	07/05/21
Tile Setter	W61.73 B37.91 T99.64

Craft: Tile Setter - Marble **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	40%	45%	50%	55%	60%	65%	70%	75%	85%	95%

Ratio of Apprentices to Journeymen - 1:4

Craft: Tile Setter - Marble **COMMENTS/NOTES**

OVERTIME:
Hours in excess of 7 per day, Monday through Friday, and the first 7 hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. Hours in excess of 7 on Saturdays, and all hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Tile Setter - Mosaic & Terrazzo **PREVAILING WAGE RATE**

	07/01/21
Grinder or Assistant	W56.86 B38.07 T94.93
Mechanic	W58.46 B38.09 T96.55
Terrazzo Resinous Worker	W48.95 B30.71 T79.66

Craft: Tile Setter - Mosaic & Terrazzo **APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	50%	55%	60%	65%	70%	75%	85%	95%	100%	

Ratio of Apprentices to Journeymen - 1:5

Craft: Tile Setter - Mosaic & Terrazzo **COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES ENTERING PROGRAM AFTER 7-1-17:

INTERVAL PERIOD AND RATES
1500 Hours 35% 45% 60% 70% 80% 90% 100%

The regular workday consists of 7 hours, between 8:00 AM and 3:30 PM.

OVERTIME:
- Hours in excess of 7 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Good Friday, Monday after Easter, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Truck Driver **PREVAILING WAGE RATE**

	07/27/21
Bucket, Utility, Pick-up, Fuel Delivery trucks	W40.21 B38.78 T78.99
Dump truck, Asphalt Distributor, Tack Spreader	W40.21 B38.78 T78.99
Euclid-type vehicles (large, off-road equipment)	W40.31 B38.78 T79.09
Helper on Asphalt Distributor truck	W40.21 B38.78 T78.99
Slurry Seal, Seeding/Fertilizing/ Mulching truck	W40.21 B38.78 T78.99
Straight 3-axle truck	W40.21 B38.78 T78.99
Tractor Trailer (all types)	W40.31 B38.78 T79.09
Vacuum or Vac-All truck (entire unit)	W40.21 B38.78 T78.99
Winch Trailer	W40.41 B38.78 T79.19

Craft: Truck Driver **COMMENTS/NOTES**

BLENDED RATE:
When a truck driver is performing work on the site and also serving as a material delivery driver, the driver shall be paid a "blended rate" which shall be 80% of the above-listed wage rates, plus the full benefit rate. This rate shall be used when the driver "round robins" for a minimum of 6 hours during the work day.

HAZARDOUS WASTE REMOVAL:
- On hazardous waste removal work on a State designated hazardous waste site where the driver is in direct contact with hazardous materials and when personal protective equipment is required for respiratory, skin, and eye protection, the driver shall receive an additional $3.00 per hour (with or without protective gear).
- A hazardous waste related certified worker at a designated hazardous waste site who is not working in a zone requiring level A, B or C personal protection shall receive an additional $1.00 per hour.

TRUCK FOREMAN: $.75 cents per hour above regular rate. Overtime shall be increased accordingly.

The regular workday shall be 8 hours, starting between 6:00 AM and 8:00 AM.

SHIFT DIFFERENTIAL:
- Shifts starting at 4:00 PM (2nd Shift): + $3.00 per hour.
- Shifts starting at 12:00 AM (midnight/3rd Shift): time and one-half the hourly rate.
- Shifts starting at a time other than from 6:00 AM to 8:00 AM, when such hours are mandated by the project owner: + $3.00 per hour.

OVERTIME:
- Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Employees may work four 10-hour days at straight time, Monday through Thursday, with Friday used as a make-up day for a lost day. If Friday is not a make-up day, then all hours on Friday shall be paid at time and one-half the hourly rate.
-Benefits on overtime shall be $38.53.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day (Decoration Day), July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. The day after Thanksgiving may be substituted for Veteran's Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Truck Driver-Material Delivery Driver **PREVAILING WAGE RATE**

	07/27/21
Driver	W32.52 B38.78 T71.30

Craft: Truck Driver-Material Delivery Driver **COMMENTS/NOTES**

BLENDED RATE:
When a truck driver is performing work on the site and also serving as a material delivery driver, the driver shall be paid a "blended rate". See the "Truck Driver" craft for the blended rates.

Truck Foreman/Shop Steward: +$0.25 per hour

SHIFT DIFFERENTIALS:
- 2nd Shift shall receive an additional $0.50 per hour
- 3rd Shift shall receive time and one-half the hourly rate.

OVERTIME:
- Hours in excess of 8 per day, or before or after the regular workday that are not shift work, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day (Decoration Day), July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. The day after Thanksgiving may be substituted for Veterans Day.

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT
PREVAILING WAGE RATE DETERMINATION

County - UNION

Craft: Welder **PREVAILING WAGE RATE**

Welder

Craft: Welder **COMMENTS/NOTES**

Welders rate is the same as the craft to which the welding is incidental.

STATEWIDE RATES

TERRITORY

ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

OPERATING ENGINEERS **Rates Expiration Date :**

{For apprentice rates refer to "Operating Engineers" apprentice rates in any county rate package}

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for 5 consecutive workdays.
- When 2 shifts are worked, the second shift shall receive an additional 10% of the regular rate inclusive of benefits, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, plus an additional 10% of the regular rate inclusive of benefits, per hour. The third shift shall receive 8 hours pay for 7 hours of work, plus an additional 15% of the regular rate inclusive of benefits, per hour.
- When such hours are mandated by the project owner, a shift that starts between 8:00 PM and midnight and ends by 6:00 AM Saturday, or that starts after 8:00 PM on Sunday, provided there are consecutive hours of work within the shift, shall receive an additional 15% of the regular rate, inclusive of benefits.
- On Highway, Road, Street, and Sewer projects irregular shifts starting between 5:00 PM and 12:00 AM may be worked Monday through Friday, and shall receive an additional 15% of the regular rate, inclusive of benefits. When working with other trades that receive a higher irregular shift rate, the Operating Engineer shall also receive the higher irregular shift rate.

OVERTIME:
- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veteran's Day.

On hazardous waste removal work or asbestos removal work, on a state or federally designated hazardous waste site, where the operating engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin, and eye protection, the operating engineer shall receive an additional 20% of the hourly wage, per hour.

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
54.43	35.60	90.03	92.28

CLASSIFICATIONS:

A-Frame

Backhoe (combination)

Boom Attachment on loaders (Except pipehook)

Boring & Drilling Machine

Brush Chopper, Brush Shredder, Tree Shredder, Tree Shearer

Bulldozer, finish grade

Cableway

Carryall

Concrete Pump

Concrete Pumping System (Pumpcrete & similar types)

Conveyor, 125 feet or longer

Drill Doctor (Duties include dust collector and maintenance)

Front End Loader (2 cu. yds. but less than 5 cu. yds.)

Grader, finish

Groove Cutting Machine (ride-on type)

Heater Planer

Hoist: Outside Material Tower Hoist (all types including steam, gas, diesel, electric, air
hydraulic, single and double drum, concrete, brick shaft caisson,
snorkle roof, and other similar types, Except Chicago-boom type) * receives an addtional $1.00 per hour on 100 ft. up to 199 ft. total height, and an additional $2.00 per hour on 200 ft. and over total height.

Hydraulic Crane (10 tons & under)

Hydraulic Dredge

Hydro-Axe

Hydro-Blaster

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
54.43	35.60	90.03	92.28

CLASSIFICATIONS:

Jack (screw, air hydraulic, power-operated unit, or console type, Except hand jack or pile load test type)

Log Skidder

Pan

Paver, concrete

Plate & Frame Filter Press

Pumpcrete (unit type)

Pumpcrete, Squeezecrete, or Concrete Pumping machine (regardless of size)

Scraper

Side Boom

Straddle Carrier (Ross and similar types)

Whiphammer

Winch Truck (hoisting)

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
52.52	35.60	88.12	90.37

CLASSIFICATIONS:

Asphalt Curbing Machine

Asphalt Plant Engineer

Asphalt Spreader

Autograde Curb Trimmer & Sidewalk Shoulder Slipform (CMI & similar types)

Autograde Curecrete Machine (CMI & similar types)

Autograde Tube Finisher & Texturing Machine (CMI & similar types)

Bar Bending Machines (Power)

Batcher, Batching Plant, & Crusher [On Site]

Belt Conveyor System

Boom-Type Skimmer Machine

Bridge Deck Finisher

Bulldozer (all sizes)

Captain (Power Boats)

Car Dumper (railroad)

Compressor & Blower unit for loading/unloading of concrete, cement, fly ash, or similar type materials (used independently or truck-mounted)

Compressor (2 or 3 battery)

Concrete Breaking Machine

Concrete Cleaning/Decontamination Machine

Concrete Finishing Machine

Concrete Saw or Cutter (ride-on type)

Concrete Spreader (Hetzel, Rexomatic & similar types)

Concrete Vibrator

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
52.52	35.60	88.12	90.37

CLASSIFICATIONS:

Conveyors - under 125 feet

Crane Signalman

Crushing Machine

Directional Boring Machine

Ditching Machine - Small (Ditchwitch, Vermeer or similar types)

Dope Pot - Mechanical (with or without pump)

Dumpster

Elevator

Fireman

Fork Lift (Economobile, Lull & similar types)

Front End Loader (1 cu. yd. and over but less than 2 cu. yds.)

Generator (2 or 3 battery)

Giraffe Grinder

Goldhofer/Hydraulic Jacking Trailer

Grader & Motor Patrols

Grout Pump

Gunnite Machine (Excluding nozzle)

Hammer - Vibratory (in conjunction with generator)

Heavy Equipment Robotics - Operator/Technician

Hoist (roof, tugger, aerial platform hoist, house car)

Hopper

Hopper Doors (power operated)

Ladder (motorized)

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
52.52	35.60	88.12	90.37

CLASSIFICATIONS:

Laddervator

Locomotive (Dinky-type)

Maintenance Utility Man

Master Environmental Maintenance Technician

Mechanic

Mixer (Except paving mixers)

Pavement Breaker (truck-mounted or small self-propelled ride-on type)

Pavement Breaker - maintenance of compressor or hydraulic unit

Pipe Bending Machine (power)

Pitch Pump

Plaster Pump (regardless of size)

Post Hole Digger (post pounder, auger)

Rod Bending Machines

Roller (black top)

Scale (power)

Seamen Pulverizing Mixer

Shoulder Widener

Silo

Skimmmer Machine (boom type)

Steel Cutting Machine (service & maintenance)

Tamrock Drill

Tractor

Transfer Machines

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
52.52	35.60	88.12	90.37

CLASSIFICATIONS:

Tug Captains

Tug Master (Power Boats)

Ultra High Pressure Waterjet Cutting Tool System - Operator/Maintenance Technician

Vacuum Blasting Machine - Operator/Maintenance Technician

Vibrating Plant (used with unloading)

Welder & Repair Mechanic

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
49.18	35.60	84.78	87.03

CLASSIFICATIONS:

Assistant Engineer/Oiler

Driller's Helper

Field Engineer - Transit man or Instrument man

Maintenance Apprentice (Deckhand)

Maintenance Apprentice (Oiler)

Mechanic's Helper

Off Road Back Dump

Tire Repair & Maintenance

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
46.60	35.60	82.20	84.45

CLASSIFICATIONS:

Field Engineer - Rodman or Chainman

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
56.76	35.60	92.36	94.61

CLASSIFICATIONS:

Lead Engineer, Foreman Engineer, Safety Engineer (minimum)

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
56.02	35.60	91.62	93.87

CLASSIFICATIONS:

Autograde Pavement Profiler (CMI & similar types)

Autograde Pavement Profiler - Recycle Type (CMI & similar types)

Autograde Placer/Trimmer/Spreader Combination (CMI & similar types)

Autograde Slipform Paver (CMI & similar types)

Backhoe (Excavator)

Central Power Plant

Concrete Paving Machine

Cranes, Derricks, Pile Drivers (all types), under 100 tons with a boom (including jib and/or leads) under 100 ft.

Draglines

Drill, Bauer, AMI and similar types

Drillmaster, Quarrymaster

Drillmaster/Quarrymaster (down-the-hole drill), rotary drill, self-propelled hydraulic drill, self-powered drill

Elevator Grader

Field Engineer-Chief of Party

Front End Loader (5 cu. yards or larger)

Gradall

Grader, Rago

Helicoptor Co-Pilot

Helicoptor Communications Engineer

Juntann Pile Driver

Locomotive (large)

Mucking Machine

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
56.02	35.60	91.62	93.87

CLASSIFICATIONS:

Pavement & Concrete Breaker (Superhammer & Hoe Ram)

Pile Driver

Prentice Truck

Roadway Surface Grinder

Scooper (loader & shovel)

Shovel (Excavator)

Trackhoe (Excavator)

Tree Chopper with boom

Trenching Machine (cable plow)

Tunnel Boring Machine

Vacuum Truck

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
50.89	35.60	86.49	88.74

CLASSIFICATIONS:

Chipper

Compressor (single)

Concrete Spreader (small type)

Conveyor Loader (Except elevator graders)

Engines, Large Diesel (1620 HP) & Staging Pump

Farm Tractor

Fertilizing Equipment (operation & maintenance)

Fine Grade Machine (small type)

Form Line Grader (small type)

Front End Loader (under 1 cubic yard)

Generator (single)

Grease, Gas, Fuel, & Oil Supply Trucks

Heaters (Nelson or other type)

Lights - portable generating light plant

Mixer, Concrete (small)

Mulching Equipment (operation & maintenance)

Power Broom or Sweeper

Pump (diesel engine & hydraulic - regardless of power)

Pump (larger than 2 inch suction, including submersible pumps)

Road Finishing Machine (small type)

Roller - grade, fill, or stone base

Seeding Equipment (operation & maintenance)

Sprinkler & Water Pump Trucks

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
50.89	35.60	86.49	88.74

CLASSIFICATIONS:

Steam Generator or Boiler

Stone Spreader

Tamping Machine (vibrating ride-on type)

Temporary Heating Plant (Nelson or other type, including proprane, natural gas, and flow-type units)

Water or Sprinkler Truck

Welding Machine (gas, diesel, or electric convertor, of any type)

Welding System - Multiple (rectifier transformer type)

Wellpoint Systems (including installation by bull gang and maintenance)

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
57.84	35.60	93.44	95.69

CLASSIFICATIONS:

Helicoptor Pilot/Engineer

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
62.52	35.60	98.12	100.37

CLASSIFICATIONS:

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with boom (including jib and/or leads) 140 ft. and over

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
61.52	35.60	97.12	99.37

CLASSIFICATIONS:

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with boom (including jib and/or leads) from 100 ft. to 139 ft.

OPERATING ENGINEERS **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
58.02	35.60	93.62	95.87

CLASSIFICATIONS:

Cranes, Derricks, Pile Driver (all types) , under 100 tons with a boom (including jib and/or leads) 140 ft. and over

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
60.52	35.60	96.12	98.37

CLASSIFICATIONS:

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with a boom (including jib and/or leads) under 100 ft.

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
57.02	35.60	92.62	94.87

CLASSIFICATIONS:

Cranes, Derricks, Pile Driver (all types), under 100 tons with a boom (including jib and/or leads) from 100 ft. to 139 ft.

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

{For apprentice rates refer to "Operating Engineers" apprentice rates in any county rate package}

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for 5 consecutive workdays.
- When 2 shifts are worked, the second shift shall receive an additional 10% of the regular rate inclusive of benefits, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, plus an additional 10% of the regular rate inclusive of benefits, per hour. The third shift shall receive 8 hours pay for 7 hours of work, plus an additional 15% of the regular rate inclusive of benefits, per hour.
- When such hours are mandated by the project owner, a shift that starts between 8:00 PM and midnight and ends by 6:00 AM Saturday, or that starts after 8:00 PM on Sunday, provided there are consecutive hours of work within the shift, shall receive an additional 15% of the regular rate, inclusive of benefits.
- On Highway, Road, Street, and Sewer projects irregular shifts starting between 5:00 PM and 12:00 AM may be worked Monday through Friday, and shall receive an additional 15% of the regular rate, inclusive of benefits. When working with other trades that receive a higher irregular shift rate, the Operating Engineer shall also receive the higher irregular shift rate.

OVERTIME:
- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veteran's Day.

On hazardous waste removal work or asbestos removal work, on a state or federally designated hazardous waste site, where the operating engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin, and eye protection, the operating engineer shall receive an additional 20% of the hourly wage, per hour.

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
59.65	35.60	95.25	97.50

CLASSIFICATIONS:

Helicopter Co-Pilot & Communications Engineer

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
55.59	35.60	91.19	93.44

CLASSIFICATIONS:

A-Frame

Cherry Picker -10 tons or less (Over 10 tons use crane rate)

Hoist (all types Except Chicago-boom)

Jack (screw, air hydraulic, power-operated unit or console type, Except hand jack or pile load test type)

Side Boom

Straddle Carrier

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

Effective Dates:

07/01/2021			07/01/2022
Rate	Fringe	Total	Total
52.93	35.60	88.53	90.78

CLASSIFICATIONS:

Aerial Platform Used On Hoists

Apprentice Engineer/Oiler with Compressor or Welding Machine

Captain (Power Boats)

Compressor (2 or 3 in battery)

Concrete Cleaning/Decontamination Machine Operator

Conveyor or Tugger Hoist

Directional Boring Machine

Elevator or House Car

Fireman

Forklift

Generator (2 or 3)

Heavy Equipment Robotics, Operator/Technician

Maintenance Utility Man

Master Environmental Maintenance Technician

Tug Master (Power Boats)

Ultra High Pressure Waterjet Cutting Tool System Operator/Maintenance Technician

Vacuum Blasting Machine Operator/Maintenance Technician

Welding Machines, Gas or Electric Converters on any type-2 or 3 in battery including diesels

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
51.40	35.60	87.00	89.25

CLASSIFICATIONS:

Compressor (Single)

Generators

Welding Machines, Gas, Diesel, Or Electric Converters of any type-single

Welding System, Multiple (Rectifier Transformer Type)

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
49.64	35.60	85.24	87.49

CLASSIFICATIONS:

Assistant Engineer/Oiler

Drillers Helper

Field Engineer - Transit/Instrument Man

Maintenance Apprentice (Deckhand)

Maintenance Apprentice (Oiler)

Off Road Back Dump

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
57.21	35.60	92.81	95.06

CLASSIFICATIONS:

Lead Engineer, Foreman Engineer, Safety Engineer (Minimum)

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
46.60	35.60	82.20	84.45

CLASSIFICATIONS:

Field Engineer - Rodman or Chainman

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
56.35	35.60	91.95	94.20

CLASSIFICATIONS:

Field Engineer-Chief of Party

Vacuum Truck

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
64.54	35.60	100.14	102.39

CLASSIFICATIONS:

Cranes (all cranes, land or floating with booms, including jib, 140 ft. and over, above ground). Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, 140 ft. and over, above ground), and Pile Drivers (all types) 100 tons and over and Tower Cranes.

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
62.88	35.60	98.48	100.73

CLASSIFICATIONS:

Cranes (all cranes, land or floating with booms including jib, less than 140 ft. abovr ground), Derricks (all derricks. land, floating or Chicago Boom type with booms including jib, less than 140 ft. above ground), Pile Drivers (all types), 100 tons and over and Tower Crane.

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
60.04	35.60	95.64	97.89

CLASSIFICATIONS:

Cranes (all cranes, land or floating with booms including jib, 140 ft. and over, above ground), Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, 140 ft. and over, above ground), Pile Drivers (all types), under 100 tons.

Effective Dates:

	07/01/2021		07/01/2022
Rate	Fringe	Total	Total
58.38	35.60	93.98	96.23

CLASSIFICATIONS:

Cranes (all cranes, land or floating with booms including jib, less than 140 ft. above ground), Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, less than 140 ft. above ground), Pile Drivers (all types), under 100 tons.

STRUCTURAL STEEL ERECTION **Rates Expiration Date :**

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
60.04	35.60	95.64	97.89

CLASSIFICATIONS:

Helicopter Pilot & Engineer

TEST BORING PRELIMINARY TO CONSTRUCTION-SOUTH/WEST **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Monmouth, Ocean, Salem, Sussex, Warren

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 4:30 PM.

SHIFT DIFFERENTIALS:
- Shift work must run for 5 consecutive workdays.
- When 2 shifts are worked, the second shift shall receive an additional 10% of the regular rate inclusive of benefits, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, plus an additional 10% of the regular rate inclusive of benefits, per hour. The third shift shall receive 8 hours pay for 7 hours of work, plus an additional 15% of the regular rate inclusive of benefits, per hour.
- When such hours are mandated by the project owner, a shift that starts between 8:00 PM and midnight and ends by 6:00 AM Saturday, or that starts after 8:00 PM on Sunday, provided there are consecutive hours of work within the shift, shall receive an additional 15% of the regular rate, inclusive of benefits.
- On Highway, Road, Street, and Sewer projects irregular shifts starting between 5:00 PM and 12:00 AM may be worked Monday through Friday, and shall receive an additional 15% of the regular rate, inclusive of benefits. When working with other trades that receive a higher irregular shift rate, the Operating Engineer shall also receive the higher irregular shift rate.

OVERTIME:
- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veteran's Day.

On hazardous waste removal work or asbestos removal work, on a state or federally designated hazardous waste site, where the operating engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin, and eye protection, the operating engineer shall receive an additional 20% of the hourly wage, per hour.

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
56.02	35.60	91.62	93.87

CLASSIFICATIONS:

Driller

Effective Dates:

	07/01/2021		**07/01/2022**
Rate	Fringe	Total	Total
49.18	35.60	84.78	87.03

CLASSIFICATIONS:

Driller's Helper

FREE AIR TUNNEL JOBS **Rates Expiration Date :**

{For apprentice rates refer to "Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

Hazardous Waste Work:
-where Level A, B, or C protection is required: + $3.00/hr
-other Hazardous Waste site: + $1.00/hr

.

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
46.25	33.23	79.48	80.78	83.53	86.03

CLASSIFICATIONS:

Walking Boss & Superintendent

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.95	33.23	79.18	80.48	83.23	85.73

CLASSIFICATIONS:

Heading Foreman, Shaft Foreman, Rod Foreman, Electrician Foreman, Rigging Foreman

FREE AIR TUNNEL JOBS **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.45	33.23	78.68	79.98	82.73	85.23

CLASSIFICATIONS:

Iron Foreman, Caulking Foreman, Form Foreman, Cement Finishing Foreman, Concrete Foreman, Track Foreman, Cleanup Foreman, Grout Foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
47.95	33.23	81.18	82.48	85.23	87.73

CLASSIFICATIONS:

Blaster

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.90	33.23	78.13	79.43	82.18	84.68

CLASSIFICATIONS:

Top Labor Foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.55	33.23	77.78	79.08	81.83	84.33

CLASSIFICATIONS:

Skilled Men (including Caulker, Powder Carrier, all other skilled men)

Skilled Men (including Miner, Drill Runner, Iron Man, Conveyor Man, Manitenance Man, Safety Miner, Rigger, Block Layer, Cement Finisher, Tod Man)

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.40	33.23	77.63	78.93	81.68	84.18

CLASSIFICATIONS:

Semi-Skilled Men (including Bell or Signal Man Top or Bottom, Form Worker & Mover, Concrete Worker, Shaft Man, Tunnel Laborer, Caulker's Helper, all other semi-skilled)

Semi-Skilled Men (including Miner's Helper, Chuck Tender, Track Man, Nipper, Brake Man, Derail Man, Cable Man, Hose Man, Gravel Man, Form Man)

FREE AIR TUNNEL JOBS **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.00	33.23	77.23	78.53	81.28	83.78

CLASSIFICATIONS:

All Others (including Powder Watchman, Change House Attendant, Top Laborer)

DRILL FOR GROUND WATER SUPPLY **Rates Expiration Date :**

The well driller and/or helper may perform all work relative to the construction, finishing, and servicing of wells, pumps and borings for ground water supply. The present methods of well drilling entailing as they do, many diverse job operations calling for drilling, pump discharge, piping, and the operation of various types of related power equipment, shall all be within the job duties and functions of the well driller and/or helper. In the event that an extension of work should occur beyond water well drilling functions, into the field of general construction work, such extension of work would come under the appropriate rates listed elsewhere in this wage determination.

- For Work Hours, Shift Differentials, Overtime Rates, and Recognized Holidays see the "Operating Engineers" section of this wage determination.

Effective Dates:

07/01/2021			07/01/2022
Rate	Fringe	Total	Total
54.77	35.60	90.37	92.62

CLASSIFICATIONS:

Driller

Effective Dates:

07/01/2021			07/01/2022
Rate	Fringe	Total	Total
47.93	35.60	83.53	85.78

CLASSIFICATIONS:

Driller's Helper

OPERATING ENGINEERS MARINE-DREDGING **Rates Expiration Date :**

NOTE: These wage rates only apply to dredging and other marine construction activities occurring in navigable waters and their tributaries.
Boat crews carrying explosive material (dynamite, pourfex, and other similar materials) shall be paid at 120% of the hourly wage rate for hours engaged in handling of said materials. Employees required to possess a Hazardous Material Certification as a condition of employment shall be compensated at 120% of the hourly wage rate.
OVERTIME:
Hours in excess of 40 per week, and all hours on Saturdays and Sundays, shall be paid at time and one-half the hourly rate. All hours on holidays shall be paid at double the hourly rate.
RECOGNIZED HOLIDAYS: New Year's Day, Martin Luther King Day, Good Friday, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

Effective Dates:

10/01/2020

Rate	Fringe	Total
41.42	15.29	56.71

CLASSIFICATIONS:

Lead Dredgerman, Operator, Leverman

Licensed Tug Operator (over 1000 HP)

Effective Dates:

10/01/2020

Rate	Fringe	Total
35.82	14.84	50.66

CLASSIFICATIONS:

Derrick Operator, Spider/Spill Barge Operator

Engineer, Electrician, Chief Welder, Chief Mate

Fill Placer, Operator II

Licensed Boat Operator

Maintenance Engineer

Effective Dates:

10/01/2020

Rate	Fringe	Total
33.72	14.67	48.39

CLASSIFICATIONS:

Certified Welder

OPERATING ENGINEERS MARINE-DREDGING **Rates Expiration Date :**

Effective Dates:

10/01/2020

Rate	Fringe	Total
32.80	14.30	47.10

CLASSIFICATIONS:

Mate, Drag Barge Operator, Steward, Assistant Fill Placer

Welder

Effective Dates:

10/01/2020

Rate	Fringe	Total
31.74	14.21	45.95

CLASSIFICATIONS:

Boat Operator

Effective Dates:

10/01/2020

Rate	Fringe	Total
26.37	13.48	39.85

CLASSIFICATIONS:

Shoreman, Deckhand, Rodman, Scowman

Effective Dates:

10/01/2020

Rate	Fringe	Total
36.91	14.93	51.84

CLASSIFICATIONS:

Crane Operator

MICROSURFACING/SLURRY SEAL **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem
IN ALL OTHER COUNTIES use the Heavy and General Laborers - North "Slurry Seal Laborer" rates.

SHIFT DIFFERENTIALS:
Any shift starting at 3:30 PM or later shall receive an additional $0.35/hr

OVERTIME:
Hours in excess of 8 per day or 40 per week shall be paid at time and one-half the hourly rate. All hours on holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

Effective Dates:

03/01/2017

Rate	Fringe	Total
36.50	21.27	57.77

CLASSIFICATIONS:

Foreman

Effective Dates:

03/01/2017

Rate	Fringe	Total
33.80	21.27	55.07

CLASSIFICATIONS:

Box man

Effective Dates:

03/01/2017

Rate	Fringe	Total
31.75	21.27	53.02

CLASSIFICATIONS:

Microsurface/Slurry Preparation

Effective Dates:

03/01/2017

Rate	Fringe	Total
31.75	21.27	53.02

CLASSIFICATIONS:

Squeegee man

MICROSURFACING/SLURRY SEAL **Rates Expiration Date :**

Effective Dates:

03/01/2017

Rate	Fringe	Total
30.30	21.27	51.57

CLASSIFICATIONS:

Cleaner, Taper

ASPHALT LABORERS - SOUTH **Rates Expiration Date :**

"THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem
{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}
The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.
SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.
OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.
RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.
Hazardous Waste Work:
-where Level A, B, or C protection is required: + $5.00/hr
-other Hazardous Waste site: + $1.00/hr
FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.75	33.23	78.98	80.28	84.03	87.53

CLASSIFICATIONS:

Paving Foreman

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.30	33.23	77.53	78.83	81.58	84.08

CLASSIFICATIONS:

Head Raker

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.45	33.23	77.68	78.98	81.73	84.23

CLASSIFICATIONS:

Screedman

ASPHALT LABORERS - SOUTH **Rates Expiration Date :**

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
43.90	33.23	77.13	78.43	81.18	83.68

CLASSIFICATIONS:

Tampers, Smoothers, Kettlemen,
Painters, Shovelers, Roller Boys

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.00	33.23	77.23	78.53	81.28	83.78

CLASSIFICATIONS:

Milling Controller

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

CLASSIFICATIONS:

Traffic Control Coordinator

Effective Dates:

03/19/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.15	33.23	77.38	78.68	81.43	83.93

CLASSIFICATIONS:

Raker, Luteman

TEST BORING PRELIMINARY TO CONSTRUCTION-NORTH **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Bergen, Essex, Hudson, Middlesex, Morris, Passaic, Somerset, Union

SHIFT DIFFERENTIAL:
Employees on a shift other than between the hours of 8:00 AM and 5:00 PM shall receive an additional $2.00 per hour.

OVERTIME:
Hours in excess of 8 per day, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

Hazardous Waste Pay (for Levels A, B, and C): an additional 15% of the hourly rate, per hour.

A newly hired Helper with no experience in the industry shall be paid as follows:
1st year on the job - 70% of Helper wage rate
2nd year on the job - 80% of Helper wage rate
3rd year on the job - 90% of Helper wage rate
All helpers receive full fringe benefit rate.

Effective Dates:

10/18/2020			10/18/2021	10/18/2022
Rate	Fringe	Total	Total	Total
32.92	29.50	62.42	64.17	65.92

CLASSIFICATIONS:

Helper (4th year helper)

Effective Dates:

10/18/2020			10/18/2021	10/18/2022
Rate	Fringe	Total	Total	Total
41.74	29.50	71.24	73.24	75.24

CLASSIFICATIONS:

Driller

Effective Dates:

10/18/2020			10/18/2021	10/18/2022
Rate	Fringe	Total	Total	Total
47.78	29.50	77.28	79.28	81.28

CLASSIFICATIONS:

Foreman

HEAVY & GENERAL LABORERS - NORTH **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.
FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

Hazardous Waste Work:
-where Level A, B, or C protection is required: + $5.00/hr
-other Hazardous Waste site: + $1.00/hr

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
43.50	33.23	76.73	78.03	80.78	83.28

CLASSIFICATIONS:

"D" Rate:
basic, landscape, asphalt, slurry seal, or railroad track laborer; utility meter installer; flagman; salamander tender; pitman; dumpman; rakers or tampers on cold patch work; wrappers or coaters of pipe; waterproofer; timberman; wagon drill or drill master helper; powder carrier; magazine tender; signal man; power buggy operator; tree cutter; operator of basic power tools

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

CLASSIFICATIONS:

"C" Rate:
pipe layer; laser man; conduit or duct line layer; operator of jack hammer, chipping hammer, pavement breaker, concrete cutter, asphalt cutter, sheet hammer, or walk-behind saw cutter; sandblaster; acetylene cutting or burning; wagon drill, directional drill, or hydraulic drill operator; drill master; core driller; traffic control coordinator; asphalt raker or lute man

HEAVY & GENERAL LABORERS - NORTH **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.45	33.23	77.68	78.98	81.73	84.23

CLASSIFICATIONS:

"B" Rate:
concrete finisher; setter of brick or stone pavers; stone cutter; form setter; manhole, catch basin, or inlet builder; asphalt screedman; rammer; hardscaping; gunite nozzle man

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
48.00	33.23	81.23	82.53	85.28	87.78

CLASSIFICATIONS:

"A" Rate:
blaster

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.75	33.23	78.98	80.28	84.03	87.53

CLASSIFICATIONS:

"FOREMAN" Rate:
labor foreman, asphalt foreman, drill foreman, pipe foreman, grade foreman, finisher foreman, concrete foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
46.75	33.23	79.98	81.28	85.03	88.53

CLASSIFICATIONS:

"GENERAL FOREMAN" Rate

HEAVY & GENERAL LABORERS - SOUTH **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.

FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

Hazardous Waste Work:
-where Level A, B, or C protection is required: + $5.00/hr
-other Hazardous Waste site: + $1.00/hr

Effective Dates:

	03/10/2021		**09/01/2021**	**03/01/2022**	**03/01/2023**
Rate	Fringe	Total	Total	Total	Total
43.50	33.23	76.73	78.03	80.78	83.28

CLASSIFICATIONS:

basic, landscape, or railroad track laborer; utility meter installer; flagman; salamander tender; pitman; dumpman; rakers or tampers on cold patch work; wrappers or coaters of pipe; waterproofers; tree cutter, timberman

Effective Dates:

	03/10/2021		**09/01/2021**	**03/01/2022**	**03/01/2023**
Rate	Fringe	Total	Total	Total	Total
43.50	33.23	76.73	78.03	80.78	83.28

CLASSIFICATIONS:

wagon drill or drill master helper; powder carrier; magazine tender; signal man

HEAVY & GENERAL LABORERS - SOUTH **Rates Expiration Date :**

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

CLASSIFICATIONS:

pipe layer; laser man; conduit or duct line layer; operator of jack hammer, chipping hammer, pavement breaker, concrete cutter, asphalt cutter, sheet hammer, or walk-behind saw cutter; sandblaster; acetylene cutting or burning

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

CLASSIFICATIONS:

wagon or directional drill operator; drill master

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
48.00	33.23	81.23	82.53	85.28	87.78

CLASSIFICATIONS:

blaster

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.75	33.23	78.98	80.28	84.03	87.53

CLASSIFICATIONS:

labor foreman, drill foreman, pipe foreman, grade foreman, finisher foreman, concrete foreman

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
46.75	33.23	79.98	81.28	85.03	88.53

CLASSIFICATIONS:

general foreman

HEAVY & GENERAL LABORERS - SOUTH **Rates Expiration Date :**

Effective Dates:

03/10/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.45	33.23	77.68	78.98	81.73	84.23

CLASSIFICATIONS:

concrete finisher; setter of brick or stone pavers; stone cutter; form setter; manhole, catch basin, or inlet builder; rammer; gunite nozzle man

PIPELINE - MAINLINE TRANSMISSION **Rates Expiration Date :**

These rates apply to the following: welding on Transportation Mainline pipe lines (cross-country pipe lines, or any segments thereof, transporting coal, gas, oil, water or other transportable materials, vapors or liquids, including portions of such pipe lines within private property boundaries up to the final metering station or connection - the point where a valve, consumer connection, or town border station divides mainline transmission lines or higher pressure lateral and branch lines from lower pressure distribution systems).

PER DIEM PAYMENT:
In addition to the total wage rate paid for each craft, the following per diem (per day) amounts must also be paid - Pipeline Journeyman: $80.50; Pipeline Journeyman Welder: $140.50; and Pipeline Helper: $64.50. Note: in order to receive the per diem payment an employee must work a minimum of 8 hours in a 24 hour period.

NOTES:
- Journeymen employed as "stringer bead" welders and journeymen who are regularly employed as "hot-pass" welders shall receive $1.00 per hour more than other journeymen.
- Welders running "stringer bead" or "hot-pass" on "cutouts" or "tie-ins" on a production basis shall be paid $1.00 per hour above the journeymen rate.
- Whenever a welder helper is employed using a power buffer or power grinder immediately behind the stringer bead and/or hot-pass welders, and the pipe gang is set on a production basis, the helper shall be paid $2.00 per hour above the helper rate.
- If back welding is performed inside a pipe under either or both of the following conditions, the welder engaged in the welding will receive $3.00 per hour above the regular rate for the job only for the days on which such back welding is performed:
  - The employer elects, as a regular procedure, to back weld each line-up. This condition is not intended to apply to occasional back welding performed by the pipe gang to repair a bead, to rectify a "high-lo" condition or wall thickness, etc.
  - A welder is required to back weld a completed weld behind the firing line.
- If the welder helper is required to go inside the pipe for the purpose of brushing, buffing and grinding the weld, they shall receive a wage rate $1.00 per hour above the regular
helper rate for the days involved.
- Welders working on "hot work" shall be paid $2.00 per hour above the regular rate for each day engaged in such work. "Hot work' is defined as work on lines in service where there is the danger of fire or explosion.

The regular workday shall be 8 hours, between 8:00 AM and 4:30 PM.

OVERTIME:
Hours in excess of 8 per day, and all hours on Sundays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

Effective Dates:

06/15/2021

Rate	Fringe	Total
54.64	33.55	88.19

CLASSIFICATIONS:

Pipeline Journeyman Welder

PIPELINE - MAINLINE TRANSMISSION **Rates Expiration Date :**

Effective Dates:

06/15/2021

Rate	Fringe	Total
54.64	33.55	88.19

CLASSIFICATIONS:

Pipeline Journeyman

Effective Dates:

06/15/2021

Rate	Fringe	Total
33.84	23.17	57.01

CLASSIFICATIONS:

Pipeline Helper

PIPELINE - GAS DISTRIBUTION **Rates Expiration Date :**

These rates apply to the following: welding on gas line distribution systems (that portion of the gas distribution system placed in streets, roads, subways, tunnels, viaducts, highways and easements which serves the users of gas).

SHIFT DIFFERENTIALS:
An "irregular" shift may start any time from 5:00 PM to 12:00 AM, Monday through Friday, and shall receive an additional 15% of the regular rate per hour, inclusive of benefits.

OVERTIME:
Hours in excess of forty per week, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

Effective Dates:

	11/02/2020		**11/01/2021**	**11/01/2022**
Rate	Fringe	Total	Total	Total
61.50	27.23	88.73	91.23	93.73

CLASSIFICATIONS:

Pipeline Journeyman Welder

Effective Dates:

	11/02/2020		**11/01/2021**	**11/01/2022**
Rate	Fringe	Total	Total	Total
61.50	27.23	88.73	91.23	93.73

CLASSIFICATIONS:

Pipeline Journeyman

Effective Dates:

	11/02/2020		**11/01/2021**	**11/01/2022**
Rate	Fringe	Total	Total	Total
39.46	19.88	59.34	61.01	62.68

CLASSIFICATIONS:

Pipeline Helper

ASPHALT LABORERS- NORTH **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:
Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren
{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}
The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.
SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.
OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.
RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.
Hazardous Waste Work:
-where Level A, B, or C protection is required: + $5.00/hr
-other Hazardous Waste site: + $1.00/hr
FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
45.75	33.23	78.98	80.28	84.03	87.53

CLASSIFICATIONS:

Asphalt Foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.45	33.23	77.68	78.98	81.73	84.23

CLASSIFICATIONS:

Asphalt Screedman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

CLASSIFICATIONS:

Asphalt Raker or Lute Man

ASPHALT LABORERS- NORTH **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
43.50	33.23	76.73	78.03	80.78	83.28

CLASSIFICATIONS:

Asphalt Laborer

ELECTRICIAN- UTILITY WORK (NORTH) **Rates Expiration Date :**

Electrician-Utility Work (North)
(For apprentice rates refer to Electrician-Utility Work (North) in any county rate package).
These rates apply to work contracted for by the following utility companies:
Public Service Electric & Gas Co. of NJ, GPU Energy, Borough of Madison Electric Department, Sussex Rural Electric Cooperative, Rockland Utilities, and Butler Municipal Electric Co.
These rates do not apply to work on substations or switching stations.
For Utility work contracted for by a utility company other than those listed above or those listed under "Electrician-Utility Work (South), see the "Outside Commercial Rates" for the county in which the jobsite is located.

* FOR OUTSIDE COMMERCIAL RATES PLEASE SEE COUNTY RATES

The regular workday is 8 hours, between 6:00 AM and 6:00 PM.
FOR EMERGENCY WORK ONLY: (emergency work is defined as work caused by storm, catastrophe, act of god, and circumstances beyond the control of the employer)-all hours of work shall be paid at double the hourly rate.
SHIFT DIFFERENTIALS:
Shift work must run for a minimum of 5 consecutive workdays.
2nd shift (between the hours of 4:30 PM and 1:00 AM): 8 hours of work + 17.3% of the regular rate, inclusive of benefits.
3rd shift (between the hours of 12:30 AM and 9:00 AM): 8 hours of work + 31.4% of the regular rate per hour, inclusive of benefits.

OVERTIME:
Hours in excess of 8 per day, or before or after the regular wokday Monday through Friday, that is not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
Four 10-hour days may worked, at straight time, between 7:00 AM and 6:30 PM, Monday through Thursday.

RECOGNIZED HOLIDAYS:
New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day and Christmas Day, or day on which they are legally observed.

Effective Dates:

11/29/2020

Rate	Fringe	Total
57.30	39.54	96.84

CLASSIFICATIONS:

Chief Lineman

Effective Dates:

11/29/2020

Rate	Fringe	Total
54.06	37.30	91.36

CLASSIFICATIONS:

Journeyman Lineman

ELECTRICIAN- UTILITY WORK (NORTH) **Rates Expiration Date :**

Effective Dates:

11/29/2020

Rate	Fringe	Total
54.06	37.30	91.36

CLASSIFICATIONS:

Special License Operator

Effective Dates:

11/29/2020

Rate	Fringe	Total
53.52	36.92	90.44

CLASSIFICATIONS:

Transit Man

Effective Dates:

11/29/2020

Rate	Fringe	Total
51.90	35.80	87.70

CLASSIFICATIONS:

Line Equipment Operator

Effective Dates:

11/29/2020

Rate	Fringe	Total
45.41	31.32	76.73

CLASSIFICATIONS:

Dynamite Man

Effective Dates:

11/29/2020

Rate	Fringe	Total
67.57	46.62	114.19

CLASSIFICATIONS:

General Foreman

Effective Dates:

11/29/2020

Rate	Fringe	Total
62.17	42.88	105.05

CLASSIFICATIONS:

Assistant General Foreman

ELECTRICIAN- UTILITY WORK (NORTH) **Rates Expiration Date :**

Effective Dates:

11/29/2020

Rate	Fringe	Total
60.55	41.77	102.32

CLASSIFICATIONS:

Line Foreman

Effective Dates:

11/29/2020

Rate	Fringe	Total
43.79	30.20	73.99

CLASSIFICATIONS:

Street Light Mechanical Leader

Effective Dates:

11/29/2020

Rate	Fringe	Total
41.63	28.71	70.34

CLASSIFICATIONS:

Groundman Winch Operator

Effective Dates:

11/29/2020

Rate	Fringe	Total
41.63	28.71	70.34

CLASSIFICATIONS:

Groundman Truck Operator

Effective Dates:

11/29/2020

Rate	Fringe	Total
41.08	28.35	69.43

CLASSIFICATIONS:

Street Light Mechanic

Effective Dates:

11/29/2020

Rate	Fringe	Total
41.08	28.35	69.43

CLASSIFICATIONS:

Line Equipment Mechanic

ELECTRICIAN- UTILITY WORK (NORTH) **Rates Expiration Date :**

Effective Dates:

11/29/2020

Rate	Fringe	Total
35.14	24.24	59.38

CLASSIFICATIONS:

Groundman 2nd Year

Effective Dates:

11/29/2020

Rate	Fringe	Total
32.44	22.36	54.80

CLASSIFICATIONS:

Groundman 1st Year

Effective Dates:

11/29/2020

Rate	Fringe	Total
53.52	36.92	90.44

CLASSIFICATIONS:

Line Equipment Foreman

ELECTRICIAN- UTILITY WORK (SOUTH) **Rates Expiration Date :**

Electrician-Utility Work (South)
(For apprentice rates refer to Electrician-Utility Work (South) in any county rate package).
These rates apply to work contracted for by the following utility company:
Atlantic City Electric.
These rates do not apply to work on substations or switching stations.
For utility work contracted for by a utility company other than the one listed above or those listed under "Electrician-Utility Work (North), see the "Outside Commercial Rates" for the county in which the jobsite is located.

* FOR OUTSIDE COMMERCIAL RATES PLEASE SEE COUNTY RATES

The regular workday is 8 hours, between 7:00 AM and 4:30 PM.
FOR EMERGENCY WORK ONLY: (emergency work is defined as work caused by storm, catastrophe, act of god, and circumstances beyond the control of the employer)- all hours of work shall be paid at double the hourly rate.
SHIFT DIFFERENTIALS:
Shift work must run for a minimum of 5 consecutive workdays.
When two (2) or three (3) shifts are worked the following shall apply:
1st shift (between the hours of 8:00 AM and 4:30 PM)
2nd shift (between the hours of 4:30 PM and 12:30 AM): 8 hours of work + 10% of the regular rate of pay for 7.5 hours worked.

3rd shift (between the hours of 12:30 AM and 8:00 AM): 8 hours of work + 15% of the regular rate of pay for 7 hours worked.

OVERTIME:
Hours in excess of 8 per day, or before or after the regular wokday Monday through Friday, that is not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate. All hours on Sundays and Holidays shall be paid double the hourly rate.

Four 10-hour days may be worked, at straight time, between 6:00 AM and 6:00 PM, Monday through Thursday with Friday used as a make-up day.

RECOGNIZED HOLIDAYS:
New Year's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day and Christmas Day or on days celebrated.

WORKING RULES:
There shall be a Foreman in charge of each work crew. No crews are to exceed twelve (12) men, including Foremen.

There shall be a General Foreman designated for transmission work when three (3) or more crews are on the same job and for distribution work where there are are more than twenty (20) employees on site.
A small job crew shall consist of five (5) or less employees, one (1) of the Journeyman Linemen in the crew shall be designated as a Small Job Foreman.
Work performed from ladders and/or mechanical lift equipment shall be the work of Linemen and/or Apprentices.
On new construction, fitting and framing poles, towers or structures may be done by Journeymen and/or Apprentices. Groundmen may assist, but may not perform any work which would be performed by Linemen if assembled in the air.
There shall be a Journeyman Lineman in each pole setting, erection, grounding, wire and cable-pulling crew of more than three (3) men.

Effective Dates:

12/02/2020

Rate	Fringe	Total
63.56	51.00	114.56

CLASSIFICATIONS:

General Foreman

ELECTRICIAN- UTILITY WORK (SOUTH) **Rates Expiration Date :**

Effective Dates:

12/02/2020

Rate	Fringe	Total
56.43	46.88	103.31

CLASSIFICATIONS:

Foreman

Effective Dates:

12/02/2020

Rate	Fringe	Total
53.46	45.13	98.59

CLASSIFICATIONS:

Small Job Foreman

Effective Dates:

12/02/2020

Rate	Fringe	Total
49.50	42.79	92.29

CLASSIFICATIONS:

Heavy Equipment Operator

Effective Dates:

12/02/2020

Rate	Fringe	Total
49.50	42.79	92.29

CLASSIFICATIONS:

Cable Splicer

Effective Dates:

12/02/2020

Rate	Fringe	Total
49.50	42.79	92.29

CLASSIFICATIONS:

Journeyman Lineman

Effective Dates:

12/02/2020

Rate	Fringe	Total
49.50	42.79	92.29

CLASSIFICATIONS:

Journeyman Welder

ELECTRICIAN- UTILITY WORK (SOUTH) **Rates Expiration Date :**

Effective Dates:

12/02/2020

Rate	Fringe	Total
49.50	42.79	92.29

CLASSIFICATIONS:

Journeyman Painter

Effective Dates:

12/02/2020

Rate	Fringe	Total
39.60	36.94	76.54

CLASSIFICATIONS:

Light Equipment Operator

Effective Dates:

12/02/2020

Rate	Fringe	Total
34.65	34.00	68.65

CLASSIFICATIONS:

Groundman Truck Driver

Effective Dates:

12/02/2020

Rate	Fringe	Total
32.18	32.55	64.73

CLASSIFICATIONS:

Groundman 3rd Year

Effective Dates:

12/02/2020

Rate	Fringe	Total
29.70	31.09	60.79

CLASSIFICATIONS:

Groundman 2nd Year

Effective Dates:

12/02/2020

Rate	Fringe	Total
27.23	29.62	56.85

CLASSIFICATIONS:

Groundman 1st Year

TERRITORY

ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT

PREVAILING WAGE RATE DETERMINATION

ELECTRICIAN- UTILITY WORK (SOUTH) **Rates Expiration Date :**

Effective Dates:

12/02/2020

Rate	Fringe	Total
21.78	26.40	48.18

CLASSIFICATIONS:

Flagman

HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS **Rates Expiration Date :**

THESE RATES APPLY TO CONSTRUCTION ON NEW TRANS HUDSON TUNNELS ONLY

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

SHIFT DIFFERENTIALS:
- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional $3.00 per hour.

OVERTIME:
- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

Hazardous Waste Work:
-where Level A, B, or C protection is required: + $3.00/hr
-other Hazardous Waste site: + $1.00/hr

Effective Dates:

03/03/2021			**09/01/2021**	**03/01/2022**	**03/01/2023**
Rate	Fringe	Total	Total	Total	Total
69.38	33.23	102.61	104.31	107.86	111.19

CLASSIFICATIONS:

Walking Boss & Superintendent

Effective Dates:

03/03/2021			**09/01/2021**	**03/01/2022**	**03/01/2023**
Rate	Fringe	Total	Total	Total	Total
68.93	33.23	102.16	103.86	107.41	110.74

CLASSIFICATIONS:

Heading Foreman, Shaft Foreman, Rod Foreman, Electrical Foreman, Rigging Foreman

HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
68.18	33.23	101.41	103.11	106.66	109.99

CLASSIFICATIONS:

Iron Foreman, Caulking Foreman, Form Foreman, Cement Finishing Foreman, Concrete Foreman, Track Foreman, Clean-up Foreman, Grout Foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
71.93	33.23	105.16	106.86	110.41	113.74

CLASSIFICATIONS:

Blaster

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
67.35	33.23	100.58	102.28	105.83	109.16

CLASSIFICATIONS:

Top Labor Foreman

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
66.83	33.23	100.06	101.76	105.31	108.64

CLASSIFICATIONS:

Skilled Men (including Caulker, Powder Carrier, all other skilled men)
Skilled Men (including Miner, Drill Runner, Iron Man, Conveyor Man, Maintenance Man, Safety Miner, Rigger, Block Layer, Cement Finisher, Rod Man)

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
66.60	33.23	99.83	101.53	105.08	108.41

CLASSIFICATIONS:

Semi-Skilled Men (including Bell or Signal Man top or bottom, Form Worker & Mover, Concrete Worker, Shaft Man, Tunnel Laborer, Caulker's Helper, all other semi-skilled)
Semi-Skilled Men (including Miner's Helper, Chuck Tender, Track Man, Nipper, Brake Man, Derail Man, Cable Man, Hose Man, Gravel Man, Form Man)

HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS **Rates Expiration Date :**

Effective Dates:

03/03/2021			09/01/2021	03/01/2022	03/01/2023
Rate	Fringe	Total	Total	Total	Total
66.00	33.23	99.23	100.93	104.48	107.81

CLASSIFICATIONS:

All others (including Powder Watchman, Change House Attendant, Top Laborer, Job Steward)

Table of Contents

END OF TABLE OF CONTENTS

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and drawing conventions.

1.3 PROJECT INFORMATION

A. Project Identification: Parking Deck.

1. Project Locations: Caldwell Place and Elizabethtown Plaza, Elizabeth, NJ

B. Owner: County of Union New Jersey

C. Architect: Netta Architects, 1084 Route 22 West, Mountainside, NJ.

D. MEP and FP Engineer: Concord Engineering, 520 Burnt Mills Road, Voorhees, NJ.

E. Structural Engineer: O'Donnell & Naccarato, 200 Central Avenue, Mountainside, NJ.

F. Site/Civil Engineer: Paulus, Sokolowski and Sartor, 67B Mountain Boulevard Extension, Warren, NJ.

G. Parking Deck Consultant: THA Consulting, 144 Livingston Avenue, New Brunswick, NJ.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the demolition of the existing parking structure and design of replacement parking deck with offices for County Sheriff. The general scope of work includes, but is not necessarily limited to the following:

1. Building demolition and removal.
2. Precast concrete parking deck, concrete block walls, parking controls, gates, lighting, deck waterproofing, painting, elevators, drainage and paving.
3. Interior finishes, heating, electrical, plumbing and fixtures, fire protection and security.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:30 a.m. to 3:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Only as permitted by Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 50 feet of entrances, operable windows, or outdoor-air intakes.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect,

sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract Documents, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

C. Contractor Responsibilities: Contractor shall compensate the Architects and/or his consultants at a cost of $155.00 per hour for all re-designs. Contractor shall not be required to compensate the Architect and/or his consultants if a re-design is required because of a latent or changed condition.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Owner’s Representative will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Owner’s Representative may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Contractor's name and address.
d. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Description of the Work.
    b. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

6. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored on-site, but not yet installed.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.

2. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Requests for Information (RFIs).
3. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect may schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Critical work sequencing and long-lead items.
c. Designation of key personnel and their duties.
d. Lines of communications.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Use of the premises and existing building.
l. Working hours.
m. Owner's occupancy requirements.
n. Responsibility for temporary facilities and controls.
o. Procedures for disruptions and shutdowns.
p. Parking availability.
q. Equipment deliveries and priorities.
r. Security.
s. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

1) Status of submittals.
2) Deliveries.
3) Progress cleaning.
4) Quality and work standards.
5) Status of correction of deficient items.
6) Field observations.
7) Status of RFIs.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain

orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Paper Submittals: Not allowed.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number, numbered consecutively.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Compliance with specified standards.
c. Notation of coordination requirements.
d. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

E. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

I. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect.

Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Re-testing/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

B. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no less than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Storage and Staging: Provide temporary offsite area for storage and staging needs.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Maintain and touch up signs, so they are legible at all times.

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

E. Temporary Elevator Use: Use of elevators is not permitted.

F. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of

interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Equipment supports.
d. Piping, ductwork, vessels, and equipment.
e. Noise- and vibration-control elements and systems.

2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.2 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.3 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg. F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Utilize containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Execution" for progress cleaning of Project site.
2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.

4. Submit list of incomplete items in the following format:

    a. PDF electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

B. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, roof, yard, and grounds, in areas disturbed by construction activities, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
e. Remove debris and surface dust from limited access spaces, including plenums, shafts, trenches, equipment vaults and similar spaces.
f. Remove labels that are not permanent.
g. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
h. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Division 01 Section "Execution" for final property survey.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

B. Record Specifications: Submit one paper copy or annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy or annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or

entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Revisions to electrical circuitry.
d. Changes made by Change Order or Construction Change Directive.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file, paper copy or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building demolition.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Division 01 Section "Summary" for use of the premises and phasing requirements.
2. Division 01 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site

1. Inspect and discuss condition of construction to be demolished.

2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property and for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

B. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping of utility services.

1.7 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
   a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

B. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Store items in a secure area until delivery to Owner.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Arrange to shut off utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least four hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely .

D. Existing Utilities: Abandon or completely remove where required as follows:

1. Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
2. Demolish and remove existing utilities and below-grade utility structures.

E. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings.
6. Building frame members.
7. Building walls.

B. Related Sections:

1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.
2. Submit documentation indicating quantity of fly ash used as a replacement for cement or other cement replacements.
3. Submit documentation when using equivalent design mixtures that do not contain cement replacements.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all steel reinforcing shop drawings.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.
15. Mechanical Splices.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control test and inspection reports.

G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures through single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code-Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, “Specification for Structural Concrete.”
2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”
3. ACI 216, “Guide for Determining Fire Endurance of Concrete Elements”.

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor’s superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), or Grade 75, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Epoxy-Coated Reinforcing Bars: [ASTM A 934/A 934M], epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

E. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, assembled with clips.

F. Plain-Steel Wire: ASTM A 82 /A 82M.

G. Deformed-Steel Wire: ASTM A 496/A 496M.

H. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, deformed steel wire, with less than 2 percent damaged coating in each 12-inch (300-mm) wire length.

I. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

J. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/ A 497M, flat sheet.

K. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

F. Mechanical Splices: For splicing reinforcing bars, splice material must conform with testing set forth in ASTM 1034/1034M, and shall develop in tension or compression, as required, at least 125% of the specified yield strength of the bar.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, II, III, IV, V color as indicated on Architectural Contract documents. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330, 3/4-inch (19-mm) nominal maximum aggregate size.

E. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
   b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
   c. Euclid Chemical Company (The), an RPM company; ARRMATECT, EUCON BCN, EUCON CIA.
   d. Grace Construction Products, W. R. Grace & Co.; DCI.
   e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
   b. Cortec Corporation; MCI- 2000 2005NS.
   c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
   d. Sika Corporation; FerroGard 901.

2.6 WATERSTOPS

A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Adeka Ultra Seal/OCM, Inc.; Adeka Ultra Seal.
   b. Greenstreak; Hydrotite.
   c. Vinylex Corp.; Swellseal.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
   b. Meadows, W. R., Inc.; Perminator 15 mil.

c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. Granular Fill: Refer to Geotechnical Report.

C. Fine-Graded Granular Material: Refer to Geotechnical Report.

2.8 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ChemMasters; Chemisil Plus.
b. ChemTec Int'l; ChemTec One.
c. Conspec by Dayton Superior; Intraseal.
d. Curecrete Distribution Inc.; Ashford Formula.
e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
f. Edoco by Dayton Superior; Titan Hard.
g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.
j. Meadows, W. R., Inc.; LIQUI-HARD.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group; Duro-Nox.
m. Symons by Dayton Superior; Buff Hard.
n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. BASF Construction Chemicals - Building Systems; Confilm.
b. ChemMasters; SprayFilm.
c. Meadows, W. R., Inc.; EVAPRE.
d. Sika Corporation; SikaFilm.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Products: Subject to compliance with requirements,:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec by Dayton Superior; Cure and Seal WB.
e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
g. Edoco by Dayton Superior; Spartan Cote WB II.
h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
i. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
j. Lambert Corporation; Glazecote Sealer-20.
k. L&M Construction Chemicals, Inc.; Dress & Seal WB.
l. Meadows, W. R., Inc.; Vocomp-20.
m. Metalcrete Industries; Metcure.
n. Nox-Crete Products Group; Cure & Seal 150E.
o. Symons by Dayton Superior; Cure & Seal 18 Percent E.
p. TK Products, Division of Sierra Corporation; TK-2519 WB.
q. Vexcon Chemicals, Inc.; Starseal 309.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products: Subject to compliance with requirements, [**available products that may be incorporated into the Work include, but are not limited to, the following**]:

a. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
g. Lambert Corporation; UV Safe Seal.
h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
i. Meadows, W. R., Inc.; Vocomp-30.
j. Metalcrete Industries; Metcure 30.
k. Right Pointe; Right Sheen WB30.
l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Agent: Slurry coat, Type I or Type II cement, mixed to a maximum water to cement ratio of 0.62

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume may be used to reduce the total amount of portland cement. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent. 25 percent
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture , plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

B. Basement, Retaining, and Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture as indicated on contract documents according to manufacturer's written instructions.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture as indicated on contract documents at manufacturer's recommended rate.
8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture as indicated on contract documents at manufacturer's recommended rate.

D. Suspended Slabs: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture as indicated on contract documents according to manufacturer's written instructions.

E. Suspended Slabs: Proportion structural lightweight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Calculated Air Dry Unit Weight: 107-113 lb/cu. ft. (1713-1810 kg/cu. m) as determined by ASTM C 567, or per the requirements set forth in the fire rating specifications.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch (10 mm) for slabs exposed to freeze and thaw only.
5. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch (10 mm) or less for slabs exposed to freeze and thaw only.
6. Air Content: For trowel-finished floors 5 ½ percent, plus or minus 1 ½ percent at point of concrete placement.
7. Steel-Fiber Reinforcement: Add to concrete mixture as indicated on contract documents according to manufacturer's written instructions.

F. Concrete Toppings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
5. Air Content: Do not allow air content of troweled finished toppings to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture as indicated on contract documents according to manufacturer's written instructions.

G. Building Frame Members: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for elements exposed to freeze and thaw only.

H. Building Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for walls exposed to freeze and thaw only.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities per Architectural documents and designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

Retain option in first subparagraph below if adopting recommendation of ACI 347. ACI 301 requires concrete to reach its specified compressive strength.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M), ACI 347 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturers recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into

preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view as indicated on Architectural documents.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete as indicated on Architectural documents.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system and as indicated on Architectural documents.
2. Finish on-grade and supported surfaces to the applicable minimum following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface. The contractor shall supply floor leveling material and other corrective measures in areas where floor finish provisions exceed the flatness and levelness requirements. Per ACI 302.1R, F(L) requirements should only be applied to slabs-on-ground that are level and suspended slabs that are both level and shored.

    a. For carpeted slabs, specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    b. For thin floor coverings, specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    c. For thin floor coverings, specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method and as indicated on Architectural documents. While concrete is still plastic, slightly scarify surface with a fine broom.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs as indicated in contract documents, in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete, Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Except as otherwise indicated on drawings or specified herein, all work under this Section shall conform to applicable requirements of the local Building Code and regulations of all government authorities having jurisdiction, applicable State Code, and ACI 318.

B. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor shall coordinate scheduling of testing and inspections with Owner’s engaged agent

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M, and either ASTM C617 (Bonded Caps) or ASTM C1231 (Unbonded Caps).

    a. Cast and laboratory cure four sets of two standard cylinder specimens for each composite sample.

b. Cast and field cure additional sets of two standard cylinder specimens for construction sequencing purposes as required.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days, two sets of two specimens at 28 days and hold one set of two specimens
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) [for strengths above 5,000 psi, 0.1f' c in lieu of 500 psi]
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for concrete filled bollards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:

1. "General Requirements."
2. "Reinforcement and Reinforcement Supports."
3. "Concrete Mixtures."
4. "Handling, Placing, and Constructing."

B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 1064, as drawn.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150, Type I.

C. Normal-Weight Aggregate: ASTM C 33, 1-1/2-inch nominal maximum aggregate size.

D. Water: ASTM C 94.

2.4 RELATED MATERIALS

A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.

2.5 CONCRETE MIXTURES

A. Comply with ACI 301.

B. Normal-Weight Concrete:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.6 CONCRETE MIXING

A. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 VAPOR-RETARDER INSTALLATION

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturers recommended adhesive or joint tape.

3.2 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.3 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: Install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.4 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

3.5 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.

1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

3.6 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.

D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

3.7 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

END OF SECTION 033053

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work Included:

1. Polish concrete floor slab finishing.

B. Related Requirements:

1. Division 03 Section "Cast-In-Place Concrete" for concrete slab installation.
2. Division 07 Section "Joint Sealants."

1.3 SYSTEM DESCRIPTION

A. Polished concrete finishing includes:

1. Grinding and honing of the slab surface to receive clear reactive, penetrating liquid hardener/densifier.
2. Application of clear reactive, penetrating liquid hardener.
3. Progressively polishing and burnishing of the slab surface to achieve approved finish.
4. Application of stain resistant surface treatment.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Installer Certification: Certificates by manufacturer stating that installer is listed applicator of special concrete finishes.

C. Samples: Finished samples for color selection approval.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of concrete polishing products required for this Project.

B. Mock-up: Demonstrate the materials, equipment and application methods to be used for work specified herein in pre-approved location approximately 50 sq. ft. in area or as directed by the Owner’s Representative or Architect.

1. Retain approved mock-up during construction as a standard for judging the completed work. Areas may remain as part of the completed work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

B. Store concrete hardener/densifier and surface protectant treatment in environment recommended on published manufacturer’s product data sheets.

1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 40 and 100 degrees F.
2. Keep lights, fire, sparks and heat away from containers.
3. Keep containers tightly closed when not in use.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment and resurfacing performance.

1. Apply when surface and air temperature are between 40 degrees F and above 95 degrees F unless otherwise indicated by manufacturer’s written instructions.
2. Apply when surface and air temperatures are expected to remain above 40 degrees F for a minimum of 8 hours after application, unless otherwise indicated by manufacturer’s written instructions.
3. New concrete must cure a minimum of 28 days or as directed by the manufacturer before application of resurfacing materials.
4. Ventilation: Provide adequate ventilation in confined or enclosed areas in accordance with manufacturer’s instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Polished Concrete Floor Manufacturer: The Basis of Design for polished concrete floor finishing includes "Consolideck" products manufactured by Procoso, Inc. Subject to compliance with requirements, provide polish concrete finishing products manufactured by the Basis of Design manufacturer or equal.

2.2 MATERIALS (PC1)

A. Concrete Repair and Pre-Densifier Cleaner: provide the following products by Prosoco, Inc. or equal

1. Liquid Concrete Repair Material: Low-odor, liquid fill material used to fill pinholes, small air voids and pop-outs, micro-cracks and other gaps in concrete surface during grinding; “Consolideck Grind-N-Fill”.

2. Cleaner: To remove dirt, oil, grease, and other stains from existing slab surface; "Consolideck Cleaner/Degreaser".

B. Penetrating Concrete Hardener/Densifier: Lithium silicate hardener/densifier; "Consolideck LS" by Prosoco, Inc. or equal, with the following properties:

1. Abrasion Resistance: Greater than 50 percent improvement over untreated samples when tested in accordance with ASTM C1353.
2. Achieve 'High Traction Range' readings when tested in accordance with ANSI B101.1.
3. Coefficient of Friction: Greater than 0.60 dry, Greater than 0.60 wet when tested in accordance with ASTM C1028.
4. Adhesion: Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
5. Water Vapor Transmission: 100 percent retained when compared to untreated samples when tested in accordance with ASTM E96 Method B (Water Method).
6. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

C. Translucent Concrete Dye: General Purpose water-carried, penetrating, translucent colored dye; "Consolideck GemTone Stain" by Prosoco, Inc. or equal.

D. Concrete Protective Treatments: Provide protective treatment offering medium gloss protective treatment with increased resistance damage from water, staining and abrasion.

1. MediumGloss: General Purpose medium gloss, film forming sealer, "Consolideck PolishGuard" by Prosoco, Inc. or equal, with the following properties:

a. 'High Traction Range' readings when tested in accordance with ANSI B101.1.
b. Coefficient of Friction: Greater than 0.60 dry, Greater than 0.60 wet when tested in accordance with ASTM C1028.
c. Stain Resistance: Achieve limited or no adverse effects when tested in accordance with ASTM D1038
d. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

2.3 EQUIPMENT

A. Scrubbing, Grinding and Polishing Equipment:

1. Auto Scrubber Machine: For cleaning operations.
2. Hand Grinder or stand-up edger for edge grinding/polishing.
3. Polishing Equipment: Dry grinding/polishing machines shall include a dust extraction system, including HEPA filtration vacuum

B. Diamond Segments: Use heads from the same manufacturers throughout the entirety of the project.

C. Diamond Heads Types:

1. Metal Diamonds: 60, 80 or 150.
2. Hybrid Style Diamonds: 50 or 100.
3. Resin Bonded, Phenolic Diamonds: 100, 200, 400, 800, 1300 and 3000 (if necessary).

D. Burnishing Machine and Burnishing Pads: Provide the following to produce specified results.

1. Burnishing Machine: High speed burnisher, generating pad speeds of 1,500 RPM or higher, as recommended by protective treatment manufacturer. Dust skirt must be installed at time of work.

2. Burnishing Pads: As recommended by protective treatment manufacturer.

   a. White Burnishing Pad, non-abrasive, “Consolideck Heat Pad” by Prosoco, Inc. or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment and resurfacing.
2. Fill substrate voids to prevent underlayment and resurfacing from leaking.

B. Clean dirt, dust, oil, grease and other contaminants that interfere with penetration or performance of specified product from surfaces. Use appropriate concrete cleaners approved by the concrete surface treatment manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of product.

C. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of product

D. Variations in substrate texture and color will affect final appearance and should be corrected prior to application of sealer/hardener system and the polishing steps.

E. Protect surrounding areas prior to application. If product is accidentally misapplied to adjacent surfaces, flush with water immediately before material dries.

F. Avoid contact in areas not to be treated. Avoid contact with metal, glass and painted surfaces.

G. Do not proceed until unsatisfactory conditions have been corrected.

3.3 CONCRETE GRINDING, HONING, AND POLISHING

A. Adhere to industry standard polishing procedures for dry and wet grinding/polishing is acceptable when industry standard polishing procedures are adhered to.

B. Scrub and rinse slab surface with clean water and vacuum with auto-scrubber between and after final polishing passes.

C. Sequential progression of diamond polishing steps shall be required and limited to no more than double the grit value of the previous diamonds used.

D. Overlap adjacent polishing passes by 25 percent

E. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.

F. Progressively grind and polish the slab surface utilizing approved diamond segments as necessary to produce Finishing requirements.

1. Apply liquid concrete repair material to fill gaps, voids and pop-outs during grinding operation per manufacturer's published recommendations

3.4 APPLICATION OF PENETRATING TRANSLUCENT DYE

A. Dilute translucent dye with water, or other approved solvent as recommended by manufacturer to create desired color. Apply dye within 24 hours of dilution.

B. Lightly wet a clean microfiber pad with diluted translucent concrete dye, leaving the pad damp.

C. After 200 –grit, apply prepared diluted translucent dye to the clean, dry concrete with a low pressure sprayer with a conical spray pattern per manufacturer's recommendations.

D. Using pre-wet microfiber pad, immediately spread the spray-applied diluted translucent dye to ensure uniform wetting and color distribution.

E. Allow treated surface to dry for one hour minimum prior to walking on or auto scrubbing.

F. Remove excess stain residue by cleaning slab with auto scrubber or dry burnisher and allow treated surface to dry.

G. Dry polish floor with 400 grit resin diamonds.

H. Clean slab with auto scrubber and allow surface to dry.

I. Apply second coat of penetrating diluted translucent dye, if desired. (Repeating above steps A through E) Allow treated surface to dry for one hour minimum prior to auto scrubbing or burnishing

1. As an alternative, both coats of dye may be applied at 400 grit, waiting one hour after each coat prior to auto-scrubbing or burnishing.

J. Remove excess stain residue by cleaning slab with auto scrubber or dry burnisher and allow treated surface to dry.

3.5 APPLICATION OF CONCRETE HARDENER/DENSIFIER

A. Apply a single coat of hardener/densifier at the rate of 500 to 700 square feet per gallon with a low pressure sprayer fitted with a 0.5 gpm spray tip

1. Apply sufficient material to wet the surface without producing puddles. Use a clean soft-bristle push broom or microfiber pad to spread the hardener/densifier evenly to achieve uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
2. Allow treated surface to dry.

B. Continue progressively dry polishing floor with required resin diamonds to produce desired final finish.

3.6 APPLICATION OF INTERIOR CONCRETE PROTECTIVE TREATMENT

A. Application of general purpose, medium gloss protective treatment:

1. Apply per manufacturer's published recommendations to clean, dry slab at the completion of mechanically polishing the slab surface.
2. Lightly wet a clean microfiber pad with specified film forming sealer; wring out excess, leaving the pad damp.
3. Spray-apply protective treatment using a clean, pump-up sprayer fitted with a 0.5 gpm conical or fan spray tip at an estimated coverage rate of 400 to 800 square feet per gallon. Work from one control joint to another.
4. Spread with the damp microfiber pad. Maintain a thin, even coating and wet edge. Stop spreading once drying begins. Do not overlap. Repeat steps 1 through 4. Two coats are recommended for maximum protection.
5. To increase gloss, wait at least 60 minutes after the final coat is applied, and then use a high-speed burnisher fitted with a white polishing pad. Burnish at a fast walking pace.

3.7 SLAB PROTECTION

A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession. Clean spills immediately. Provide cleaning chemicals and absorptive materials.

B. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.

C. Develop a concrete protection procedure which addresses the following procedures:

1. Communication of protection plan to subcontractors and vendors.
2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.

D. Provide a clean slab using concrete maintenance cleaner within an auto scrubber, equipped with soft nylon brushes, in accordance with manufacturer's recommendations.

3.8 FINISHING REQUIREMENTS

A. Appearance: Slab surface must meet the desired sheen and color and be consistent with approved Mock-up.

END OF SECTION 033543

SECTION 034100 PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Precast structural concrete.
2. Precast structural concrete with commercial architectural finish.

B. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
2. Division 05 Section "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
3. Division 05 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
4. Division 07 Section "Garage Waterproofing Systems" for water-repellent finish treatments.

1.3 DEFINITIONS

A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals: Provide submittals for the products named herein as delineated in Division 01 Section, "Sustainable Design Requirements - LEED V4 BD+C" Article 1.6, Action Submittals

C. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

D. Shop Drawings:

1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate separate face and backup mixture locations and thicknesses.
5. Indicate type, size, and length of welded connections by AWS standard symbols.
6. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Include and locate openings larger than 10 inches (250 mm). Where additional structural support is required, include header design.
9. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
10. Indicate relationship of precast structural concrete units to adjacent materials.
11. Indicate locations, dimensions, and details of thin-brick units, including corner units and special shapes, and joint treatment.
12. Indicate locations, dimensions, and details of stone facings, anchors, and joint widths.
13. Indicate estimated camber for precast floor slabs with concrete toppings.
14. Indicate shim sizes and grouting sequence.
15. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

E. Samples:

1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

    a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

F. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from precast structural concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, & testing agency.

B. Welding certificates.

C. Material Certificates: For the following:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.

5. Insulation.
6. Structural-steel shapes and hollow structural sections.
7. Stone anchors and accessories.

D. Material Test Reports: For aggregates, by a qualified testing agency.

E. Preconstruction test reports.

F. Source quality-control reports.

G. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant as follows:

a. Group C, Category C3 - Prestressed Straight Strand Structural Members
b. Group CA, Category C3A - Prestressed Straight-Strand Structural Members

B. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance, to erect Category S1 - Simple Structural Systems.

C. Installer Qualifications: An experienced precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S1 - Simple Structural Systems and who can produce an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."

D. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

E. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

G. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the prescriptive requirements of authorities having jurisdiction or has been calculated according to ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," or PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

H. Sample Panels: After sample approval and before fabricating precast structural concrete units with architectural finish, produce a minimum of two sample panels approximately 16 sq. ft. (1.5 sq. m) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After approval of repair technique, maintain one sample panel at fabricator's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

I. Mockups: After sample panel approval but before production of precast structural concrete units with architectural finish, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup as indicated on Drawings including sealants and precast structural concrete units with an architectural finish complete with anchors, connections, flashings, and joint fillers.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
2. Place adequate dunnage of even thickness between each unit.
3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units.

B. Design Standards: Comply with ACI 318 (ACI 318M) and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

C. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets prescriptive requirements of authorities having jurisdiction or has been calculated according to ACI 216.1 (ACI 216.1M), PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

D. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.

E. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated on the structural drawings.

1. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318 (ACI 318M).

    a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 18 to plus 120 deg F.

2. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.
3. Vehicular Impact Loads: Design spandrel beams acting as vehicular barriers for passenger cars to resist a single 6000-lbf (26.7-kN) load applied horizontally in any direction to the spandrel beam, with anchorages or attachments capable of transferring this load to the structure. Design spandrel beams assuming the load to act at a height of 18 or 27 inches above the floor or ramp surface, whichever is more severe, on an area not to exceed 1 sq. ft. (0.0929 sq. m).

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying setting of newly placed concrete mixture to depth of reveal specified.

2.3 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), ASTM A 706/A 706M, deformed bars, with ASTM A 767/A 767M, Class II zinc coating and chromate treatment. Galvanize after fabrication and bending.

E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), ASTM A 706/A 706M, deformed bars epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

F. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420)] ASTM A 706/A 706M, deformed bars, assembled with clips.

G. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M or ASTM A 1064/A 1064M, flat sheet.

I. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed, flat sheet, Type 1 bendable coating.

J. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.4 PRESTRESSING TENDONS

A. Pretensioning Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, seven-wirelow-relaxation strand.

B. Unbonded Post-Tensioning Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, seven-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

C. Post-Tensioning Bars: ASTM A 722/A 722M, uncoated high-strength steel bar.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C 618, Class N.
3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33/C 33M, with coarse aggregates complying with Class 4S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.

D. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C 330/C 330M, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing Admixture: ASTM C 1017/C 1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
9. Corrosion-Inhibiting Admixture: ASTM C 1582/C 1582M.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.

D. Malleable-Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M) or ASTM A 490 (ASTM A 490M,) Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

1. Do not zinc coat ASTM A 490 (ASTM A 490M) bolts.

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M or electrodeposition according to ASTM B 633, SC 3, Types 1 and 2.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 or SSPC-Paint 25 according to SSPC-PA 1.

N. Welding Electrodes: Comply with AWS standards.

O. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.7 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201.

B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy Group 1 or 2 (ASTM F 738M, Grade A1 or A4), hex-head bolts and studs; ASTM F 594, Alloy Group 1 or 2 (ASTM F 836M, Grade A1 or A4) stainless-steel nuts; and flat, stainless-steel washers.

1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

C. Stainless-Steel-Headed Studs: ASTM A 276, Alloy 304 or 316, with minimum mechanical properties of PCI MNL 116.

2.8 BEARING PADS

A. Provide bearing pads for precast structural concrete units as recommended by precast fabricator for the given application.

2.9 ACCESSORIES

A. Reglets: Specified in Section 076200 "Sheet Metal Flashing and Trim."

B. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.10 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.11 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
2. Limit use of fly ash to 25 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: For structural precast concrete with an architectural finish, limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.12 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces of structural precast concrete with an architectural finish that is exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly per architectural details.

2.13 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in

ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
5. Protect strand ends and anchorages with a minimum of 1-inch- (25-mm-) thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.

H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

L. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.

M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.14 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.15 COMMERCIAL FINISHES

A. Commercial Grade: Remove fins and protrusions larger than 1/8 inch (3 mm) and fill holes larger than 1/2 inch (13 mm). Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch (5 mm).

B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch (13 mm) caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch (6 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch (3 mm).

C. Grade B Finish: Fill air pockets and holes larger than 1/4 inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch (3 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Grind smooth form offsets or fins larger than 1/8 inch (3 mm). Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.

D. Grade A Finish: Repair surface blemishes and fill air holes with the exception of air holes 1/16 inch (1.6 mm) in width or smaller, and form marks where the surface deviation is less than 1/16 inch (1.6 mm). Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.

E. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

F. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

G. Apply roughened surface finish according to ACI 318 (ACI 318M) to precast concrete units that receive concrete topping after installation.

2.16 COMMERCIAL ARCHITECTURAL FINISHES

A. Manufacture member faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform and straight. Finish exposed-face surfaces of precast concrete units to match approved sample panels, mockups and as follows:
   1. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
   2. As-Cast-Surface Finish: Provide surfaces to match approved sample or mockup for acceptable surface, air voids, sand streaks, and honeycomb.
   3. Textured-Surface Finish: Impart by form liners or inserts.
   4. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.
   5. Exposed-Aggregate Finish: Use chemical-retarding agents applied to concrete molds and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
   6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
   7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attach.
   8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
   9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
   10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
   11. Thin-Brick Facing: See "Thin-Brick Facings" Article.
   12. Stone Facing: See "Stone Facings" Article.

2.17 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

   1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.

C. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to

reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of Architect.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.

2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.
3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

    a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    c. Twist-off Tension Control Bolt: ASTM F 1852.
    d. Direct-Tension Control Bolt: ASTM F 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.

1. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
2. Fill joints completely without seepage to other surfaces.
3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
4. Place grout end cap or dam in voids at ends of hollow-core slabs.
5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
6. Keep grouted joints damp for not less than 24 hours after initial set.

I. Drilling 1/2"Ø to 3/4"Ø weep holes, typically 1’-0” from the ends of the planks beyond where grouting has flowed into the hollow-cores as required; to allow trapped water to drain out. Sources of trapped water can include rain, snow melt, wet coring and saw cutting, and deck cleaning for topping placement preparation. The general contractor should also look for signs of more trapped water at the lower floors of installed hollow-core plank as trapped water tend to migrate down to the lower floors (darker stained bottom finish and sometimes water droplets are visible). MEP and hung ceiling trades installing their work to the ceiling should also be prepared for unexpected water draining out as they drill into the bottom of the hollow-core plank. It is not recommended to leave trapped water in the plank as that can cause freeze spalls in winter conditions, mold, and damage to paint and other finish materials.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner to engage a qualified special inspector to perform the following special inspections:

1. Erection of precast structural concrete members.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.5 REPAIRS

A. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Mortar and grout.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide decorative concrete masonry units as manufactured by Concrete Products Group or an equal approved by the Architect.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.

C. Decorative CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
4. Pattern and Texture: Standard pattern, split-face finish to match existing adjacent units.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.

4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Water: Potable.

2.5 REINFORCEMENT

A. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951.

1. Exterior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Spacing of Cross Rods: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet.

2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches 10 to 11 inches as measured according to ASTM C143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.

3.8 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.9 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 051200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Structural steel.
2. Architecturally exposed structural steel.
3. Prefabricated building columns.
4. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches (38 mm).
2. Welded built-up members with plates thicker than 2 inches (50 mm).
3. Column baseplates thicker than 2 inches (50 mm).

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use ASD; data are given at service-load level.

B. Moment Connections: Type PR, partially and FR, fully restrained.

C. Construction: As indicated on Contract Documents.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show fabrication of structural-steel components. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all steel erection drawing shop drawings.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.
8. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, Fabricator, Professional Engineer, and Testing Agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.

2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.

1. Coordinate finish painting requirements with Division 09 painting Sections.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.
2. Channels, Angles**,**-Shapes**:** 60 percent.
3. Plate and Bar: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

C. W-Shapes: ASTM A 992/A 992M**,** Grade **50 .**

D. Channels, Angles**,** M , S-Shapes: ASTM A 913/A 913M, Grade 50 **(345)**].

E. Plate and Bar: [ASTM A 36/A 36M] Grade **50 (345)**].

F. Corrosion-Resisting Structural Steel, Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50 (345).

G. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B structural tubing.

H. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847/A847M, structural tubing.

I. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: As indicated on documents.

2. Finish: Black, except where indicated to be galvanized.

J. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

K. Steel Forgings: ASTM A 668/A 668M.

L. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating Mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavyhex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F1554, Grade 36 (weldable can be substituted for Grade 36) or as indicated on documents.

1. Configuration: Straight and threaded with nut for anchorage.
2. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.

G. Finish: **Plain**

H. Headed Anchor Rods: ASTM F 1554, Grade 36 (ASTM F 1554, Grade 55, weldable can be substituted for Grade 36) straight with heavy-hex head, or as indicated on documents.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
3. Washers: ASTM F 436 (ASTM F 436M) Type 1, hardened carbon steel.
4. Finish: Plain.

I. Threaded Rods: ASTM A 36/A 36M ASTM A 193/A 193M Grade B7.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Washers: [ASTM F 436 (ASTM F 436M) Type 1, hardened] [ASTM A 36/A 36M] carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

J. Clevises and/or Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

K. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

L. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

M. Expansion Anchors: Type and size as indicated on documents. Wedge type, torque-controlled, with impact section to prevent thread damage and wedge ridges to prevent spinning during installation, complete with required nuts, washers, and manufacturer's installation instructions. All expansion anchors shall be equipped with length identification markings.

1. Interior Use: For use in conditioned environments free from potential moisture, provide carbon steel anchors with zinc plating in accordance with ASTM B633.
2. Exposed Use: In exposed, potentially wet, or otherwise corrosive environment, provide anchors of Type 304 or Type 316 stainless steel with stainless steel nuts, and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded faster. All nuts shall conform to ASTM A563 Grade A unless otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.
3. Products: Provide the following:
    a. Hilti Kwik Bolt TZ Expansion Anchor for installation into concrete.
    b. Hilti Kwik Bolt III Expansion Anchor for installation into masonry.

N. Cartridge Injection Adhesive Anchors and rebar doweling: Threaded steel rod or inserts, complete with nuts, washers, polymer, cementitious, epoxy, or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on documents.

1. Interior Use: For use in conditioned environments free from potential moisture, provide threaded carbon steel rods conforming to ISO898, ASTM A36, or ASTM A 193, Grade B7 as indicated on documents.
2. Exposed Use: In exposed, potentially wet or otherwise corrosive environments provide stainless steel anchors, nuts, and washers in accordance with ASTM F593. Provide nuts and washers with matching alloy group and minimum poof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform with ASTM F594 unless other otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.
3. Products: Provide the following:

    a. Hilti HAS or HIT threaded rods or rebar (by others) with Hilti HIT HY-150 Adhesive for anchorage to masonry or stone. Hilti HIT HY-20 Adhesive System for anchorage to brick or concrete masonry (with screen tubes).
    b. Hilti HAS, HIS threaded rods or rebar (by others) for doweling with Hilti HIT-RE 500-SD Adhesive Anchoring System for anchorage to concrete.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer, complying with MPI #79 and compatible with topcoat unless otherwise indicated on documents or in Division 09.

C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A 780.

2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shoppriming operations.

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC 303 for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPCSP 3, "Power Tool Cleaning."

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wallopening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

I. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated on documents.

J. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members with reinforcing as indicated on documents.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: **Snug tightened**.

B. Weld Connections: Comply with AWS D1.1/D1.1M[**and AWS D1.8/D1.8M**] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC 303 for mill material.

3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld showthrough on exposed steel surfaces.

    a. Grind butt welds flush.
    b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning", unless indicated otherwise on documents or in Division 09.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frames and/or located in exterior walls.

3. Galvanize all exposed steel.

2.09 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with Steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations, to elevations indicated, and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bondreducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service. E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld showthrough on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field fillet welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, all suspect field fillet welds and all field full/partial penetration welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

    1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
    2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors and grilles.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Elevator machine beams, hoist beams, and divider beams.
6. Steel shapes for supporting elevator door sills.
7. Metal floor plate and supports.
8. Elevator pit sump covers.
9. Miscellaneous steel trim including steel angle corner guards steel edgings.
10. Metal bollards.
11. Metal ladders.
12. Pipe Downspout guards.
13. Abrasive metal thresholds.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders and alternating tread devices, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Ladders: Ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for overhead doors and grilles.
2. Elevator machine beams, hoist beams, and divider beams.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

D. Steel Tubing: ASTM A500, cold-formed steel tubing.

E. Steel Pipe: ASTM A53, Standard Weight (Schedule 40) unless otherwise indicated.

F. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.3 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

C. Concrete: Comply with requirements in Division 03 Section "Miscellaneous Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports at exterior, wet locations and where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.6 ELEVATOR PIT SUMP COVERS

A. Fabricate from 1/8-inch rolled-steel floor plate with four 1-inch-diameter holes for water drainage and for lifting.

B. Provide steel angle supports unless otherwise indicated.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.

B. Fabricate sleeves for bollard anchorage from steel or stainless steel pipe or tubing with 1/4-inch-thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

C. Prime steel bollards with zinc-rich primer.

2.9 PIPE AND DOWNSPOUT GUARDS

A. Fabricate pipe downspout guards from 3/8-inch-thick by 12-inch-wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Prime steel pipe downspout guards with zinc-rich primer.

2.10 ABRASIVE METAL THRESHOLDS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Source Limitations: Obtain units from single source from single manufacturer.
2. Thresholds: Fluted-saddle-type units, 5 inches wide by 1/2 inch high, with tapered edges.

B. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

C. Apply bituminous paint to concealed surfaces of cast-metal units.

2.11 METAL LADDERS

A. General:

ANSI A14.3 specifies minimum design requirements for ladders and safety cages.

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

Delete first subparagraph below if spacing is indicated on Drawings or if minimum spacing in referenced standards is acceptable. ANSI A14.3 and ASME A17.1/CSA B44 minimum spacing is 16 inches (406 mm).

1. Space siderails 16 inches apart unless otherwise indicated.

First option in "Siderails" Subparagraph below is ANSI A14.3 minimum dimension for normal atmospheric exposures; second is minimum for unusual atmospheric exposures.

2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.

First option in "Rungs" Subparagraph below is ANSI A14.3 minimum dimension for normal atmospheric exposures; second is minimum for unusually corrosive atmospheric exposures.

3. Rungs: 3/4-inch-diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

Option in first subparagraph below can be deleted if supports are indicated on Drawings. ANSI A14.3 minimum support spacing is 10 feet (3 m).

6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

7. Galvanize and prime ladders, including brackets.
8. Prime ladders, including brackets and fasteners, with zinc-rich primer.

2.12 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
4. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

3.3 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches in concrete.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

D. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 INSTALLATION OF PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

3.5 INSTALLATION OF THRESHOLDS

A. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 07 Section "Joint Sealants" to provide a watertight installation.

3.6 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.7 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel railings at interior locations, stairwells and elsewhere as shown.
2. Aluminum railings at exterior locations, roof tops and elsewhere as shown.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

B. Samples for Initial Selection: For products involving selection of color, texture, or design.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
   b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F., ambient; 180 deg F., material surfaces .

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500 (cold formed).

C. Plates, Shapes, and Bars: ASTM A36.

2.4 ALUMINUM RAILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:

1. Blum, Julius & Co., Inc.
2. Kane Innovations, Inc.
3. Tubular Specialties Manufacturing, Inc.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

D. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.

2.5 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.
3. Aluminum Railing Components: Type 304 stainless steel fasteners.
4. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.6 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast stainless steel, center of handrail 2-1/2 inches from face of railing.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

H. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

I. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

J. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187.

K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Form changes in direction as follows:

1. By bending or by inserting prefabricated elbow fittings.
2. By bending to smallest radius that will not result in distortion of railing member.

K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 STEEL AND IRON FINISHES

A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

1. Exterior Railings: SSPC-SP 6/NACE No. 3.
2. Railings Indicated To Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3.
3. Railings Indicated To Receive Primers Specified in Division 09 Section "Painting": SSPC-SP 6/NACE No. 3.
4. Other Railings: SSPC-SP 3.

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless indicated.
2. Do not apply primer to galvanized surfaces.

D. Shop-Painted Finish: Comply with

1. Color: Match Architect's sample.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1 for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: As selected by Architect from manufacturer's full range.

2.9 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.

4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

D. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.
2. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.

3.6 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

3.7 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NHLA: National Hardwood Lumber Association.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Exterior type for all locations and where indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

D. Application: Treat all miscellaneous carpentry, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking and similar concealed members in contact with masonry or concrete.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Division 07 Section "Fluid-Applied Membrane Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Products: Subject to compliance with requirements, provide one of the following or equal:

a. LaFarge Gypsum (Continental Building); Exterior Gypsum Sheathing.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond e(2)XP.

2. Type and Thickness: Regular, 1/2 inch, Type X, 5/8 inch thick.
3. Size: 48 by 96 inches for vertical installation.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Power-Driven Fasteners: NES NER-272.

1. For wall sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with nails.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 071800 - GARAGE WATERPROOFING SYSTEMS

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protective concrete sealer system.
2. Elastomeric traffic deck coating system.
3. Slab and deck control joint sealant system.
4. Structural expansion joint system.
5. Architectural building joint sealing system

B. Related Sections:

1. Division 03 Section "Cast-in-place Concrete."
2. Division 03 Section "Precast Concrete."
3. Division 07 Section "Joint Sealants."
4. Division 09 Section "Painting."

1.3 ACTION SUBMITTALS

A. General: Submit the following in accordance with the Conditions of the Contract and Division I Specification sections.

B. Product Data: For each product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. A detailed statement describing the deck waterproofing system to be installed, as well as the installation methods to be employed, shall be submitted for approval prior to installation. Literature, details, samples, shop drawings, warranties, etc., shall be included in the submittal as requested.

B. A manufacturer's written acceptance and approval of the intended system applicator shall be required.

C. Qualification Data: For Installer and testing agency.

D. Sealant, Waterproofing and Restoration Institute (SWRI) validation Certificate: For each sealant specified to be validated by SWRI's Sealant validation Program.

E. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that products comply with requirements.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of waterproofing systems required for this Project.

B. Source Limitations: Obtain each type of product through one source from a single manufacturer.

C. A site inspection shall be made by applicator prior to commencing installation of the system for purposes of reviewing related conditions affecting performance requirements of this specification.

D. All products described in this section must be used with adequate ventilation and personal protection. Refer to the Material Safety Data Sheet which accompanies each product shipment for detailed health and safety information prior to use.

E. At Architect's option, Testing Agency shall take one core from each trial section per Section 3.3.C to test for sealer effectiveness in accordance with ASTM C642. Such cores will then serve as "base cores" for which the remainder of sealer application will be tested. At Architect's direction, additional cores shall be taken randomly for testing comparison with the "base cores".

F. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C I087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data
6. that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

G. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C I02I to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test elastomeric joint sealants according to SWRI's Sealant validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

H. Mockups: Build mockups incorporating products, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joint sealants in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
2. Joint sealants - Provide two 4' long mockups for each joint sealant and each substrate.
3. Deck coating systems - Provide two 4'x4' mockups for each deck coating system and each substrate.
4. Vertical membrane system - 100 sf for each type
5. Structural expansion joint system - 6 lf for each type, including transition details.
6. Expansion joint nosing material - Provide two mockups of size required for adhesion testing for each nosing material and each substrate.

I. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, deck coating, and expansion joint nosing material, field test their adhesion to substrates as follows:

1. Locate field test mockup where indicated or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
   a. Each type of elastomeric sealant indicated and the applicable joint substrates.
   b. Each type of nonelastomeric sealant indicated and the applicable joint substrates.
   c. Each type of deck coating indicated and the applicable substrates.
   d. Each type of expansion joint nosing material indicated and the applicable substrates.
3. Notify Architect seven days in advance of dates and times when tests will be performed.
4. Arrange for tests to take place with product manufacturer's technical representative present.
5. Refer to Field Quality Control under Part 3 for additional requirements.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 PERFORMANCE REQUIREMENTS

A. Provide products that establish and maintain watertight and airtight continuous waterproofing system without staining or deteriorating joint substrates.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing systems within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply waterproofing systems to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

B. Do not proceed with installation of waterproofing systems under the following conditions:

1. Do not apply waterproofing systems in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost- free conditions occur throughout the depth of substrate.
2. Contaminants capable of interfering with adhesion have not yet been removed from substrates.
3. Where conditions exist that do not meet the manufacturer's requirements for applications indicated.
4. Where conditions exist that can cause off gassing of the waterproofing systems.

C. Do not install waterproofing systems until items that penetrate the waterproofing have been installed.

1.8 WARRANTY

A. The system manufacturer and the approved applicator shall furnish a written performance joint warranty that, subject to certain specific exclusions as described in such joint warranty, the system provided will be free of defects related to workmanship or material deficiency. The following conditions shall be specifically covered under the joint warranty:

1. Cohesive or adhesive failure of materials.
2. Weathering deficiencies resulting in failure of the system to provide its intended function.
3. Abrasion or tear failure of the system resulting from normal traffic use. (Abrasive maintenance equipment, truck and construction traffic are not normal traffic use and related problems are exempted from the warranty.)

B. The system manufacturer and the approved applicator shall submit to the Owner for approval a detailed joint warranty statement consistent with the terms of this specification prior to construction. The approved joint warranty shall represent the sole warranty statement and warrant obligation for the project relating to this trade. Where an apparent conflict is found to exist with respect to the warranty language of this section and the detailed warranty statement, the more stringent warranty requirement shall supersede and control.

C. Special Manufacturer and Installer Joint Warranty: Manufacturer's standard form in which the Manufacturer and Installer jointly agree to furnish and repair or replace the product(s) that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Joint Warranty Period for all products listed in Part 2 of this Section, unless noted otherwise: Five years from date of Substantial Completion.

D. Special joint warranty specified in this article exclude deterioration or failure from the following:

1. Movement caused by structural settlement or errors attributable to design or construction resulting in stresses exceeding the manufacturer's written specifications for elongation and compression.
2. Disintegration from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Garage Waterproof Systems Manufacturer: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

1. Provide listed products or equal.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide waterproofing systems including backings, and other related materials that are compatible with one another and with substrates under conditions of service and application, as demonstrated by the system manufacturer, based on testing and field experience.

B. Protective Concrete Sealer System:

1. Acceptable concrete sealers are listed below. Application rates and solids content shall be in accordance with certified test results on the NCHRP 244 performance criteria.
2. Four Inch Cube Tests: 75% effective in reducing water absorption when compared to an untreated control sample.
3. Southern Exposure Tests: 90% effective in reducing chloride ion content when compared to an untreated control sample.
4. The following materials or equal are approved for usage under this section (40% Solids Content):
   a. "Iso-Flex 6I8 - 40 vOC", LymTal International Inc.
   b. "Protectosil Chem-Trete BSM 40D", Evonik Industries.
   c. "MasterProtect H 440" or "MasterProtectH 440 HZ", BASF Building Systems.
   d. "Planiseal WR 40", Mapei Corporation.
   e. "Euco-Guard S40" or "Baracade Silane 40", Euclid Chemical.
   f. "Sealmaster 40%", Kelmar Waterproofing Systems, Technical Barrier System, Inc.
   g. "Loxon 40% VOC Silane", Sherwin Williams.
   h. "Klere-Seal 940-S VOC", Pecora Corporation.
   i. "Penseal 244-40-S" or "Powerseal 40-W VOC", Vexcon Chemicals, Inc
5. Apply Sealer to the following locations:
   a. Slab-on-grade and supported levels within the parking deck.
   b. Concrete approach drives within the construction limits.

2.3 ELASTOMERIC TRAFFIC DECK COATING:

A. Traffic deck coating systems specified herein shall be complete systems of compatible materials. Components of systems shall include a base membrane, a traffic topping and all sealants, primers, flashing, aggregates and miscellaneous materials as required by the manufacturer to complete the system.

B. Traffic deck coating systems shall meet the following slip resistance requirements:

1. Coefficient of friction not less than 0.85 when tested under wet conditions.
2. Variation in slip resistance test results not greater than 0.I0.
3. Refer to Field Quality Control under Part 3 for additional requirements.

C. Urethane Systems: Subject to compliance with requirements, the following deck coating systems or equal are approved for usage under this section:

1. "Autogard FC", Neogard, Division of Jones-Blair.
2. "Iso-Flex 750U", LymTal International Inc.
3. "MasterSeal Traffic 2500", BASF Building Systems.
4. "Mapefloor Parking Deck System - Mapefloor PU 400Lv/Finish 4I5 NA/Finish 450", Mapei Corporation.
5. "Sikalastic 720/745", Sika Corporation.
6. "Pecora-Deck 800", Pecora Corporation.
7. "Qualideck vehicular Traffic Bearing Membrane System", Advanced Polymer Technology Corporation.

D. Application rates for medium and heavy duty systems: rates are for bidding purposes and are to be confirmed by manufacturer representative in the field using a 100 sf mockup.

1. Primer: 0.33 gal. minimum per 100 sf (300 sq. ft. maximum per gal.)
2. Polyurethane base coat: 1.33 gal. minimum per 100 sf (75 sq. ft. maximum per gal.)
3. Polyurethane wear coat: 0.5 gal. minimum per I100 sf (200 sq. ft.
4. maximum per gal.)
5. Broadcast aggregate into wear coat: 15 lbs. minimum per 100 sq. ft. to excess

6. 2nd Polyurethane wear coat (*for heavy duty systems*): 0.75 gal. minimum per 100 sf (133 sq. ft. maximum per gal.)
7. 2nd Broadcast aggregate into wear coat (*for heavy duty systems*): 15 lbs. minimum per 100 sq. ft. to excess
8. Polyurethane seal coat: 0.75 gal. minimum per 100 sf (133 sq. ft. maximum per gal.).

E. Application rates and system millage shall be determined by manufacturer in order to achieve the specified warranty.

F. Use aromatic top coat on lower tiers and 100% aliphatic top coat on top tier, or as required per manufacturer's specifications.

G. Apply Urethane System at areas over occupied spaces, conditioned spaces, rooms with equipment and as shown on the Drawings.

2.4 SLAB AND DECK CONTROL JOINT SEALANT SYSTEM

A. Sealants specified under this section shall be a complete system of compatible materials designed to produce waterproof, traffic-bearing control joint seals as detailed in the drawings. Primers, backer rods and related miscellaneous materials shall be used as recommended by the manufacturer.

B. All materials specified herein shall be unmodified polyurethanes containing no adulterants and shall meet the standards defined in federal specification ASTM C920, Type M or S, Class 25, self-leveling and non-sag sealants.

C. Sealant for Horizontal (Non-Cove) Joints: Subject to compliance with requirements, the following materials or equal are approved for usage under this section:

1. "Iso-Flex 880GB/88I/830", LymTal International Inc.
2. "Dynatred", Pecora Corporation.
3. "MasterSeal SL 2", BASF Building Systems.
4. "THC900/THC90I" or "vulkem 45 SSL", Tremco, Inc.
5. "Sikaflex-2C SL", Sika Corporation.

D. Sealant for vertical and Cove Joints: Subject to compliance with requirements, the following materials or equal are approved for usage under this section:

1. "Iso-Flex 88I/830", LymTal International Inc.
2. "Dymeric 240FC", Tremco, Inc.
3. "Sikaflex-2C NS", Sika Corporation.
4. "Dynatrol II", Pecora Corporation.
5. "MasterSeal NP 2", BASF Building Systems.

2.5 STRUCTURAL EXPANSION JOINT SEALING SYSTEMS:

A. The expansion joint sealing system shall be a complete system of compatible materials designed to produce waterproof, traffic bearing expansion joint seals as detailed on Drawings.

1. Nosing, traffic plates, blockout fillers, bond breakers, primers and miscellaneous materials required for installation shall be recommended by the system manufacturer.

B. Ribbed Extruded Elastomeric Expansion Joint System.

1. The following extruded elastomeric seal systems or equal are used singularly or in combination as detailed on the drawings and are approved for usage under this section:
   a. "Thermaflex TCR Series Expansion Joint Sealing System", Emseal Corporation.
   b. "ZB Series Expansion Joint System", C/S Group.
   c. "MM LokCrete Membrane System", MM Systems Corporation.
   d. "Iso-Flex J30L Winged Expansion Joint System", LymTal International, Inc.
   e. "Wabo ME Series Expansion Joint System", Watson Bowman Acme, BASF The Chemical Company.
   f. "CS Series Chambered Seal System", Balco, Inc.
   g. "Polycrete CR Series Membrane System", Erie Metal Specialties.
   h. "Vulkem WF Series vehicular Expansion Joints", Tremco, Inc.
2. Approved extruded elastomeric expansion joint sealing systems shall meet the following requirements:
   a. The expansion joint seal shall be heavy-duty, impact absorbing extruded rubber membrane gland with ribbed and perforated flanges capable of resisting heavy duty traffic.
   b. The exposed surface shall be non-metallic, skid resistant and resistant to ultra-violet rays and chemicals.
   c. Seal gland shall be heat weldable to ensure continuity of seal throughout.
3. The polyurethane elastomeric concrete nosing shall be reinforced with compatible aggregates for compressive strength and abrasion-resistance while preserving its flexibility during joint movements.
   a. The elastomeric gland shall be fully embedded in the concrete nosing thereby encapsulating the perforated flanges and creating watertight seal throughout.
   b. Joint Seal Directional Changes - At all changes in direction provide seals with factory heat welded splices such as 90° corners, tees and crosses. The seal shall extend a minimum of 2'-0" in each direction from the factory splice. Only straight, butt splice connections shall be allowed on the jobsite following manufacturers written instructions. All factory and field fused connections shall incorporate bonding of the complete seal profile. This includes fusing of all internal and external web configurations.
4. Use ribbed extruded elastomeric expansion joint system at the transition joint between slab-on-grade and structural slab at the ground tier and as shown on the Drawings.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, select from the following types:

   1. Type C (closed-cell material with a surface skin).

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D I056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self- adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall be installed in strict accordance with system manufacturer's recommendations employing trained installers utilizing proper tools and equipment and working under the direct supervision of a technically competent and experienced supervisor. An authorized technical representative shall attend a pre-installation conference, be present for the first day of installation and provide a minimum of three field inspection reports to the Architect during the duration of the installation.

B. All surfaces related to work under this section shall be inspected by the applicator prior to commencing work. Any conditions discovered which render the substrate unsuitable shall be reported and satisfactorily corrected prior to installation of the specified system.

C. Coordinate and verify that related work items meet the following requirements:

1. All surfaces shall be clean, dry and of sound substrate at time of application. Surfaces shall be provided free of voids, ridges and sharp projections.
2. Concrete surface finishes shall be subject to approval of the applicator.
3. Concrete surfaces shall be water cured or cured with a compatible curing compound as recommended by the manufacturer.
4. Concrete surfaces shall have cured for an acceptable period as recommended by the system manufacturer for the various components of the applicable system.

D. Environmental Conditions:

1. System application shall be at temperatures as recommended by the system manufacturer.
2. The deck surface shall be dry at time of application according to ASTM D4263, Standard Test Method for Indicating Moisture in Concrete.
3. Provide adequate ventilation in accordance with system manufacturer's recommendations during installation of the deck waterproofing system.

E. Protect all work areas from traffic until fully cured.

3.2 EXAMINATION

A. Examine joints indicated to receive waterproofing system, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting product performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PROTECTIVE CONCRETE SEALER SYSTEM

A. Clean surfaces to be treated in accordance with the system manufacturer's recommendations. Acceptable methods include sweeping, blowing, vacuuming, pressure washing, water blasting, acid etching, sand blasting, or shot blasting as required to remove all laitance and surface contaminants to insure proper penetration and/or adhesion of the sealer.
B. Seal all joints prior to general surface treatment.
C. Select and install a test section prior to general application to verify installation procedures, application rates, adhesion, penetration and condition of the finished surface.
D. Concrete sealer shall be applied in accordance with system manufacturer's recommendation at the same rates and solids contents as tested against the criteria established in NCHRP 244.
E. Materials shall be applied by pressure sprayer, spray bar or roller.
F. Application rate shall be 125 sq. ft. per gallon based on a 40% silane sealer.
G. Unsatisfactory results rejected under Section 1.4.E shall be grounds for rejection of sealer and sealer application or sealer reapplication using an approved product shall be completed at no additional cost to the Owner.
H. Sealer shall not be applied until concrete has fully cured but no earlier than 14 days after concrete has been poured. Striping shall not be placed until full cure of concrete sealer (generally, 14 days @ 70 degrees or higher) or bituminous pavement (generally, 30 days at 45 degrees or higher) has been obtained.

3.3 ELASTOMERIC TRAFFIC DECK COATING SYSTEM

A. All traffic deck coatings are to be applied to acceptable clean, dry, sound substrates. Clean surfaces to be treated in accordance with the system manufacturer's recommendations. Acceptable methods include sweeping, blowing, vacuuming, pressure washing, water blasting, acid etching, sand blasting, or shot blasting as required to remove all laitance and surface contaminants to insure proper adhesion of the deck coating.

B. Select and install a test area prior to general application to establish procedures, verify adhesion and acceptable appearance.

C. Surface preparation shall produce a surface profile matching CSP 4, 5 or 6 per ICRI 03732, as required to meet the requirements of the selected deck coating. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning. Coordinate surface preparation with the surface preparation for the corrosion-inhibiting treatment and vapor drive coating, as applicable.

D. Notify Architect 7 days prior to completion of the surface preparation. Meet with the Architect and manufacturer's representative to review surface preparation, joint preparation, adhesion test results, and crack preparation, as applicable. All joint and crack preparation shall be included in the cost of the traffic deck coating system.

1. Seal all underlying control and construction joints.
2. Cracks greater than 1/16"

a. All static cracks shall be routed (v-groove) and gravity fed with a polymer sealer. Fill cracks with oven-dried sand before applying the polymer sealer per the manufacturer's requirements. After application of the polymer sealer, broadcast dry silica sand to refusal evenly over the crack.
b. All dynamic cracks shall be routed (U-groove) and receive bond breaker and sealant as detailed.

3. Detail all joints and cracks, including cracks less than 1/16", with liquid flashing a distance of 3" on each side of the joint/crack to yield a total thickness of 30 dry mils. All dynamic cracks and joints, cracks and joints 1" and wider, and all precast double tee joints shall receive reinforcing fabric embedded in the liquid flashing detail strip. The reinforcing fabric shall be compatible with the selected deck coating system and shall prevent the deck coating system from cracking due to thermal and dynamic movement of the crack or joint. However, the reinforced detail strip is not expected to prevent cracking of the deck coating system if there are structural deficiencies that causes excessive movement, such as broken double tee connections.

E. Other detailing work including sealing around drains, penetrations, curb, column and wall bases, etc., shall be accomplished in accordance with system manufacturer's recommendations prior to general application.

F. Provide a grid system marked on the deck surface to designate the area for which a container of material must be used evenly applied to obtain the desired average dry mil film thickness. A wet mil gauge shall also be used to randomly verify that mil thickness at application is consistent with system manufacturer's recommendations.

G. Broadcast clean, dry silica aggregate into top coats to provide a skid resistant surface as recommended by system manufacturer.

H. Application shall be by squeegee, roller and power sprayer.

I. Install the elastomeric traffic deck coatings in accordance with a "wear-rated" heavy and medium duty system as specified herein.

3.4 SLAB AND DECK CONTROL JOINT SEALANT SYSTEM

A. All sealants are to be applied to clean, dry, sound substrates. Follow system manufacturer's recommendations for cleaning and preparation of joints. Tooled control joints shall be prepared by grinding with v- shaped wheel prior to sealing.

B. Select and install a test section prior to general application to verify adhesion and acceptable appearance.

C. Backer rods, bond breakers and primers shall be used in accordance with system manufacturer's recommendations.

D. Care shall be taken to completely fill joints without overflowing the joint or smearing adjacent surfaces.

E. Exposed joints shall be filled with sealant and tooled to a slightly recessed configuration to avoid direct contact with wheel traffic.

F. Sealant shall not be applied until after concrete curing procedures has been completed, typically at least 7 days after concrete has been poured.

3.5 STRUCTURAL EXPANSION JOINT SEALING SYSTEM

A. General:

1. Submit product data of expansion joint system to be used.
2. Coordinate expansion joint system with other related work before installation of such work.
3. Provide 6-inch vertical return upwards at column or wall termination as applicable.
4. Field measure prepared expansion joint gaps prior to submitting shop drawings.

B. Installation of the Ribbed and Perforated Elastomeric Expansion Joint System.

1. Provide blockouts in the concrete surface, of sufficient width and depth to receive the specified system, to be formed at the expansion joint by the concrete contractor.
2. Layout the extruded gland at maximum length possible and set the gap dimension according to the manufacturer's recommended installation temperature. Embed glands fully in the polymeric concrete nosing including perforations.
3. Fill concrete blockouts with approved polymeric nosing material flush to the top of the extruded gland and the driving surface.
4. Install secondary seal where applicable.

3.6 ARCHITECTURAL BUILDING JOINT SEALING SYSTEM

A. General:

1. Submit product data of expansion joint sealing system to be used.
2. Coordinate expansion joint sealing system with other related work before installation of such work.

B. Installation of the Architectural Building Joint Sealing System

1. Place and adhere the joint sealing system in the joints in accordance with procedures recommended by the system manufacturer, taking care to make the surface flush with the surface of the adjacent structure.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform the field tests and inspections.

B. Joint Sealant Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test mockups and completed elastomeric sealant joints as follows:
   a. Perform 2 tests for each mockup.
   b. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
   c. Perform 1 test for each 1000 feet of joint length thereafter or I test per each floor.
2. Test Method: ASTM C 1193, Appendix X1.1. As appropriate for type of joint-sealant application indicated, test joint sealants according to one of the following:
   a. Method A, Field-Applied Sealant Joint Hand Pull Tab
   b. Method B, Exposed Surface Finish Hand Pull Tab
   c. Method C, Field-Applied Sealant Joint Hand Pull Flap
   d. Method D, Water Immersion.

3. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
4. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
5. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free of voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.
6. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
7. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

C. Deck Coating Field-Adhesion Testing: Field test deck coating adhesion to substrates as follows:

1. Extent of Testing: Test mockups and completed deck coatings as follows:
   a. Perform 2 tests for each mockup.
   b. Perform 6 tests for the first 10,000 square feet of deck coating for each type of deck coating and substrate.
   c. Perform 1 test for each 10,000 square feet of deck coating thereafter, but not less than 1 test per floor.
2. Test Method: ASTM D 7234.
3. Inspect deck coating for bubbles, voids, aggregate distribution, and for application complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect deck coating preparation, installation, and testing. Record results in a log and report on the following:
   a. Dates when surface preparation was performed.
   b. Type of surface preparation.
   c. If surface contaminants such as engine oil were present on the slab prior to surface preparation and cleaning.
   d. If surface contaminants remain on the slab after surface preparation and cleaning.
   e. Relative humidity of the slabs prior to application of deck coatings.
   f. Time, date, temperature, precipitation, relative humidity, and sun exposure when deck coatings were installed. Note if conditions changed during the installation.
   g. Type of materials used for deck coating installation and wait times between each application.
   h. Deck coating dry mil thickness and if the thickness complies with specified requirements.
   i. Test dates, test locations, and adhesion results (whether deck coating failed to adhere to substrates or tore cohesively).
   j. Names of persons who performed surface preparation, who performed relative humidity testing, who installed deck coatings, and who performed adhesion tests.
5. Repair deck coatings pulled from test area by applying new deck coating following same procedures used originally. Ensure that original surfaces are clean and that new deck coating overlaps original deck coating.

D. Deck Coating Slip Resistance Testing: Field test deck coating slip resistance as follows:

1. Extent of Testing: Test mockups and completed deck coatings as follows:
   a. Perform 2 tests for each mockup.

b. Perform 6 tests for the first 10,000 square feet of deck coating for each type of deck coating.
c. Perform 1 test for each 10,000 square feet of deck coating thereafter, but not less than 1 test per floor.

2. Test Method: ASTM F I679 under wet conditions.
3. Inspect deck coating for variations in aggregate distribution. Locate tests at areas with high density of aggregate and with low density of aggregate. Record results in a log and report on the following:
   a. Test dates, test locations, and slip resistance results.
   b. Names of person who performed tests.
   c. Approximate area (square feet) of deck coating that exhibits a low density of aggregate, an average density of aggregate, and a high density of aggregate.
4. Repair deck coatings pulled from test area by applying new deck coating following same procedures used originally. Ensure that original surfaces are clean and that new deck coating overlaps original deck coating.

E. Expansion Joint Nosing Material Field-Adhesion Testing: Field test nosing material adhesion to substrates as follows:

1. Extent of Testing: Test mockups as follows:
   a. Perform 2 tests for each mockup.
2. Test Method: ASTM D 7234.
3. Inspect nosing material preparation, installation, and testing. Record results in a log and report on the following:
   a. Dates when surface preparation was performed.
   b. Type of surface preparation.
   c. If surface contaminants such as engine oil were present on the slab prior to surface preparation and cleaning.
   d. If surface contaminants remain on the slab after surface preparation and cleaning.
   e. Relative humidity of the slabs prior to application of nosing material.
   f. Time, date, temperature, precipitation, relative humidity, and sun exposure when expansion joints were installed. Note if conditions changed during the installation.
   g. Type of materials used for nosing material installation and wait times between each application.
   h. Test dates, test locations, and adhesion results (whether nosing material failed to adhere to substrates or tore cohesively).
   i. Names of persons who performed surface preparation, who performed relative humidity testing, who installed nosing material, and who performed adhesion tests.
4. Remove nosing material mockup after testing and prepare the substrate for installation of the expansion joint. Repair the substrate if necessary.

F. Evaluation of Field Test Results: Products not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove products that fail to adhere to substrates during testing or to comply with other requirements. Reapply mockups and retest until test results prove products comply with indicated requirements. Do not use products that fail to adhere to substrates during testing.

3.8 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

PROTECTION

B. Protect waterproofing systems during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so systems are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated products immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 071800

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor retarder).

2.2 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Ceiling plenums.
b. Attic spaces.
c. Where indicated.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 074243 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior aluminum composite material wall panels.

B. Related Sections:

1. Division 07 Section “Joint Sealants” for sealing joint between composite metal wall panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Basis of Design Manufacturer / Products: The following Basis of Design metal composite material wall panel products are manufactured by Bamco Inc. Subject to compliance with requirement, provide the specified products by the Basis-of-Design manufacturer or approved equal

1. Rout-and-Return Wet System “C-500“

A. Acceptable Manufactures: Subject to compliance with requirements, acceptable manufactuers of aluminum-faced composite wall panels include, but are not limited to the following or equal:

1. 3A Composites USA, Inc.; Alucobond.
2. Alcoa Inc.; Reynobond.
3. Mitsubishi Plastics Composites, Inc.; Alpolic Materials.

2.3 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, and accessories required for weathertight system.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.157 inch.
2. Core: Standard.
3. Exterior Finish: Two-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

C. Attachment Assembly Components: Formed from extruded aluminum.

2.4 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

D. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

1. Refer to Division 07 Section, “Joint Sealants”.

2.5 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints to receive sealants that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal wall panels.
2. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal wall panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
9. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

E. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

F. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."

G. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently

weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Roof insulation.

B. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Division 07 Section "Roof Specialties" for manufactured copings and roof edge flashings.
4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness if insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Crickets, saddles, and tapered edge strips, including slopes
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Tie-in with air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special No Dollar Limit warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
2. Warranty Period: 20 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to ASCE 7-16, FM Approvals 4474, UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): 45.5 lbf/sq.ft. .
2. Zone 2 (Roof Area Perimeter): 60.0 lbf/sq.ft. .
3. Zone 3 (Roof Area Corners): 81.7 lbf/sq.ft. .

D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

1. Wind Uplift Load Capacity: 90 psf.

2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D4637, Type II, scrim or fabric internally reinforced, EPDM sheet.

1. Basis of Design Product: Subject to compliance with requirements, provide Carlisle SynTec Incorporated; "Sure-Seal" or an equal product by one of the following or equal:

a. Firestone Building Products.
b. Johns Manville; a Berkshire Hathaway company.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: White on black.
4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch diameter.

E. Bonding Adhesive: Manufacturer's standard.

F. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch-wide minimum, butyl splice tape with release film.

G. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.

J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

1. Provide white flashing accessories for white EPDM membrane roofing.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured by EPDM roof membrane manufacturer, approved for use in FM Approvals' RoofNav-listed roof assemblies.

B. Polyisocyanurate Board Insulation: ASTM C1289, felt or glass-fiber mat facer on both major surfaces.

1. Basis of Design Product: Subject to compliance with requirements, provide roof insulation by Carlisle SynTec Incorporated or comparable product by one of the following or equal:

a. Firestone Building Products.
b. Johns Manville; a Berkshire Hathaway company.

2. Compressive Strength: 20 psi.
3. Size: 48 by 48 inches.
4. Thickness:

a. Base Layer: 1-1/2 inches.
b. Upper Layer: As required to achieve R-value.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Modified asphaltic, asbestos-free, cold-applied adhesive.

D. Cover Board: ASTM C1325, fiber-mat-reinforced cementitious board, 7/16-inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer when tested according to ASTM F2170.
   a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with not less than three test probes.
   b. Submit test reports within 24 hours of performing tests.
6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
8. Verify that minimum curing period recommended by roof system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Division 07 Section "Fluid-Applied Membrane Air Barriers."

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Concrete Decks:

In first subparagraph below, retain first option for 48-by-48-inch (1219-by-1219-mm) insulation boards; second option for 48-by-96-inch (1219-by-2438-mm) insulation boards.

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.

Retain first subparagraph below when a composite top layer is required over one or more layers of noncomposite molded (expanded) polystyrene or polyisocyanurate board insulation.

a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

    1) Trim insulation so that water flow is unrestricted.

e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

Retain first subparagraph below if base layer of insulation is adhered to roof deck, or to vapor retarder, or if corner and perimeter insulation is attached beneath loosely laid aggregate-ballasted roofing system.

g. Adhere base layer of insulation to concrete roof deck according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:

Retain one or both of first two subparagraphs below for hot-asphalt application. Retain both subparagraphs for application directly over concrete roof decks. Retain only second subparagraph for applications over vapor retarder.

1) Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft., and allow primer to dry.

Retain one of first two subparagraphs below and delete last subparagraphs above, for low-rise urethane adhesive application. Coordinate with product selected.

2) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

Retain option in first subparagraph below if tapered insulation is applicable.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

Retain first subparagraph below for 48-by-48-inch (1219-by-1219-mm) insulation boards.

a. Staggered end joints within each layer not less than 24 inches in adjacent rows.

Retain first subparagraph below and delete last subparagraph above for 48-by-96-inch (1219-by-2438-mm) insulation boards.

b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

1) Trim insulation so that water is unrestricted.

e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

3.5 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

a. Trim cover board so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.

4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

    a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll membrane roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Perform the following tests:

1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

a. Perform tests before overlying construction is placed.
b. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
c. Flood each area for 24 hours.
d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

1) Cost of retesting is Contractor's responsibility.

e. Testing agency shall prepare survey report indicating locations initial leaks, if any, and final survey report.

2. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

END OF SECTION 075323

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.

B. Related Requirements:
1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for installation of sheet metal flashing and trim integral with roof systems.
3. Division 07 Section "Roof Specialties" for formed roof-drainage sheet metal fabrications.
4. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure, Perimeter / Corner: 45.5 pounds per square foot.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2B (bright, cold rolled).

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing.

1. Stainless Steel: 0.016 inch thick.

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.

1. Material: Stainless steel, 0.019 inch thick.
2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Accessories:

    a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

4. Finish: Mill.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

B. Flashing Receivers: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

C. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

D. Roof-Drain Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering.
2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Built-in Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant.

1. Anchor and loosely lock back edge of gutter to continuous cleat.
2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 18 inches apart.
3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
2. Provide elbows at base of downspout to direct water away from building or into underground drainage system.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Sections for "Concrete Unit Masonry." and "Exterior Stone Cladding."

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge specialties, including but not limited to downspouts, scuppers, splash blocks and gravel stops.

B. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.
4. Division 07 Section "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure, Perimeter / Corner: 45.5 pounds per square foot.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Aluminum: 0.050 inch thick.
2. Warranty:

a. Materials shall be free of defects in material and workmanship for a period of 20 years from the date of Final Completion.
b. Finish: High-Performance Organic Coating Finish.

3. Corners: Factory mitered and continuously welded.
4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.

a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.3 ROOF-EDGE SPECIALTIES

A. One-Piece Aluminum Fascia Gravel Stops and Fascia Cap: Manufactured, one-piece, metal gravel stop in minimum 96-inch- long, but not exceeding 12-foot- long sections, with a horizontal flange and vertical leg, drain-through fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.

1. Aluminum: 0.050 inch thick.
2. Fabricate to sizes and profiles as indicated. Provide continuous water dam, spring clip, fascia cover, concealed splice plates and welded prefabricated corner units.

3. Gravel stop shall be tested for wind uplift resistance per ANSI/SPRI ES-1
4. Warranty:
   a. Finish: High-Performance Organic Coating Finish.

5. Corners: Factory mitered and continuously welded.
6. Joint Style: Overlapped, 4 inches wide.

B. Downspouts: Fabricate round downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
1. Fabricate from the following materials:

   a. Extruded Aluminum: 0.125 inch thick.

C. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scuppers.

1. Formed Aluminum: 0.032 inch thick.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim,.

1. Formed Aluminum: 0.032 inch thick.

2.4 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

B. Splash Blocks: Provide manufacturer’s standard pre-cast concrete splash blocks where required.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Extrusion Finishes:

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss or as required to match existing.

2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inchesfor nails and not less than 3/4 inchfor wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inchcenters.

3.4 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
2. Provide elbows at base of downspout to direct water away from building or into underground drainage system.

C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with roofing.

D. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Loosely lock front edge of scupper with conductor head.

2. Seal or solder exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment supports.
2. Pipe and duct supports.
3. Preformed flashing sleeves and vent stack collars.

B. Related Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
2. Division 07 Section "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.
3. Division 23 Section for power roof-mounted ventilators.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, integral metal cant or stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Galvanized 18 gauge-steel sheet.

D. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.

2.3 PIPE AND DUCT SUPPORTS

A. Adjustable-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand base, pipe support, and roller housing, with stainless-steel threaded rod designed for adjusting support height, accommodating up to 18 inch diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

B. Duct Supports: Extruded-aluminum, urethane-insulated supports, 2 inches in diameter; with manufacturer's recommended hardware for mounting to structure or structural roof deck.

1. Finish: Manufacturer's standard.

2.4 PREFORMED FLASHING SLEEVES AND VENT STACK COLLAR

A. Exhaust Fan Vent Curb/Flashing Sleeve: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted or perforated metal collar.

1. Metal: Stainless steel sheet, type 304, 22 gauge.
2. Diameter: As indicated on Drawings.
3. Finish: Manufacturer's standard.

B. Vent Stack/Pipe Flashing Sleeve: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Metal: Stainless steel sheet, type 304, 22 gauge.
2. Diameter: As indicated on Drawings.
3. Finish: Manufacturer's standard.

C. Vent Stack/Pipe Flashing Collar: Metal flashing vent stack collar with hemmed turn down edges and stainless steel fastening band.

1. Metal: Stainless steel sheet, type 304, 24 gauge thick.
2. Height: 7 inches.
3. Diameter: As indicated on Drawings.
4. Finish: Manufacturer's standard.

D. Pipe Portal Cover & Cap on roof curb:

1. Curb Cover: ABS plastic cover.
2. EPDM Cap: EPDM Rubber cap made for 1 pipe penetration, in size as indicated on drawings.
3. Metal: Stainless steel clamp.
4. Roof Curb: Insulated prefabricated roof curb.

2.5 METAL MATERIALS

A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

B. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

C. Stainless-Steel Sheet and Shapes: ASTM A 240 or ASTM A 666, Type 304.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

D. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:

1. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction and in smoke barriers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For qualified Installer.

D. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. 3M Fire Protection Products.
6. Tremco, Inc.; Tremco Fire Protection Systems Group.
7. USG Corporation.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1. Architectural Sealants: 250 g/L.

2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

a. Slag-wool-fiber or rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed.

3.5 FIELD QUALITY CONTROL

A. Contractor will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Sections:

1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

a. Fire-resistive joint system products bear classification marking of qualified testing agency.
b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify the Contractor's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:

    a. A/D Fire Protection Systems Inc.
    b. Grace Construction Products.
    c. Hilti, Inc.
    d. Johns Manville.
    e. 3M Fire Protection Products.
    f. USG Corporation.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
2. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:

    a. A/D Fire Protection Systems Inc.
    b. Grace Construction Products.
    c. Hilti, Inc.
    d. Johns Manville.
    e. Nelson Firestop Products.
    f. 3M Fire Protection Products.
    g. Tremco, Inc.; Tremco Fire Protection Systems Group.
    h. USG Corporation.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 08 Section "Glazing" for glazing sealants.
3. Division 09 Section "Gypsum Board" for sealing perimeter joints.
4. Division 09 Section "Tiling" for sealing tile joints.
5. Division 32 Section for Concrete Paving Joint Sealants for sealing joints in pavements, walkways, and curbing.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

F. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

B. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

C. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Acceptable Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:

   a. Dayton Superior Specialty Chemicals; Polytite Standard.
   b. EMSEAL Joint Systems, Ltd.; Emseal 25V.
   c. Sandell Manufacturing Co., Inc.; Polyseal.
   d. Willseal USA, LLC; Willseal 150.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Acoustical Sealant for Exposed and Concealed Joints: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:

1. GE Silicone; RCS20” Acoustical Sealant.
2. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
3. USG Corporation; SHEETROCK Acoustical Sealant.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Control and expansion joints in concrete paving.
    b. Isolation and contraction joints in cast-in-place concrete slabs.
    c. Joints between different materials listed above.
    d. Other joints as indicated.
2. Urethane Joint Sealant: Single component, non-sag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints in dimension stone cladding.
    d. Joints between metal panels.
    e. Joints between different materials listed above.
    f. Perimeter joints between materials listed above and frames of doors windows and louvers.

2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 50**.**
3. Urethane Joint Sealant: Single component, non-sag, Class 50.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

    a. Perimeter joints of exterior openings where indicated.
    b. Tile control and expansion joints.
    c. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
    d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.

2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.
b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 080671 – DOOR HARDWARE SCHEDULE

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware sets.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. RU - Corbin Russwin
6. RF - Rixson
7. SA - SARGENT
8. HD - HID

Hardware Sets

Set: 1.0
Doors: 100
Description: Fail Secure Pair - Cont Hinge

2	Continuous Hinge 087100	CFMxxSLF-HD1 EL-CEPTx32D □		PE
1	Removable Mullion 087100	907BKM 7' M96 M95 M57		RU
1	Electrified Rim Exit, Fail Secure 087100	ED5200A N9905ET M92 ACS □	630	RU
1	Rim Exit Device, Exit Only 087100	ED5200 EO	630	RU
2	Surface Closer 087100	DC8210 A11	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
1	Meeting Stile 087100	S772BL		PE
2	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
2	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA
1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Doors shall be normally closed and locked.
Authorized entry by valid card read at active leaf.
Opening the door from the outside by mechanical key over ride will activate the concealed switch (alarm).
Depressing push bar in the path of egress either leaf will activate the request to exit switch.
Free egress at all times.
Exit device trim will be locked with loss of power.

Set: 2.0
Doors: 104, 111
Description: Fail Secure exit device - single - cont hinge

1	Continuous Hinge 087100	CFMxxSLF-HD1 EL-CEPTx32D □		PE
1	Electrified Rim Exit, Fail Secure 087100	ED5200A N9905ET M92 ACS □	630	RU
1	Surface Closer 087100	DC8210 A11	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	S773BL		PE

1	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
1	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Doors shall be normally closed and locked.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key over ride will activate the concealed switch (alarm).
Depressing push bar in the path of egress will activate the request to exit switch.
Free egress at all times.
Exit device trim will be locked with loss of power.

Set: 3.0
Doors: 303, 304, 403, 404, 503, 504, 800, 801
Description: Passage function Exit Device - aluminum

1	Continuous Hinge 087100	CFMxxSLF-HD1		PE
1	Rim Exit, Passage 087100	ED5200A N910ET	630	RU
1	Surface Closer 087100	DC8210 A11	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	S773BL		PE

Set: 4.0
Doors: 103, 113
Description: Pair Door with Card reader

6	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Electric Power Transfer 087100	EL-CEPT □		SU
1	Removable Mullion 087100	907BKM 7' M96 M95 M57		RU
1	Electrified Rim Exit, Fail Secure 087100	ED5200A N9905ET M92 ACS □	630	RU
1	Rim Exit Device, Exit Only 087100	ED5200 EO	630	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
2	Conc Overhead Stop 087100	2-X36	630	RF
2	Surface Closer 087100	DC8210 A3/ A10 (as required)	689	RU
1	Threshold 087100	to architect detail		PE

1	Gasketing 087100	290APK x 2891APK		PE
2	Door Bottom 087100	420ASL		PE
2	Sweep 087100	18061CNB		PE
1	Meeting Stile 087100	S772BL		PE
1	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
1	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Doors shall be normally closed and locked.
Authorized entry by valid card read at active leaf.
Opening the door from the outside by mechanical key over ride will activate the concealed switch (alarm).
Depressing push bar in the path of egress either leaf will activate the request to exit switch.
Free egress at all times.
Exit device trim will be locked with loss of power.

Set: 5.0
Doors: 114
Description: Fail Secure pair - unoccupied space

6	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
2	Electric Power Transfer 087100	EL-CEPT □		SU
1	Dust Proof Strike 087100	570	US26D	RO
2	Flush Bolt 087100	555/ 557 (as required)	US26D	RO
1	Fail Secure Lock 087100	ML20606 x NAC-SEC NSA ACS □	626	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
2	Surface Closer 087100	DC8210 A3/ A10 (as required)	689	RU
2	Kick Plate 087100	K1050 10" high BEV CSK	US32D	RO
2	Wall Stop 087100	RM860/ RM861	US26D	RO
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
2	Door Bottom 087100	420ASL		PE

2	Sweep 087100	18061CNB		PE
1	Meeting Stile 087100	S772BL		PE
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA
1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1		SU

Notes: Door shall be normally closed and locked.
Inactive leaf will be fastened by means of manual flush bolts.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key will activate the concealed switch (alarm).
Rotating the lever handle from the inside will activate the request to exit switch.
Free egress at all times.

Set: 6.0
Doors: 300, 300A, 400, 400A, 500, 500A
Description: Fail Secure pair - unoccupied space

6	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
2	Electric Power Transfer 087100	EL-CEPT		SU
1	Dust Proof Strike 087100	570	US26D	RO
2	Flush Bolt 087100	555/ 557 (as required)	US26D	RO
1	Fail Secure Lock 087100	ML20606 x NAC-SEC NSA ACS	626	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
2	Surface Closer 087100	DC8210 A11	689	RU
2	Kick Plate 087100	K1050 10" high BEV CSK	US32D	RO
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
2	Door Bottom 087100	420ASL		PE
2	Sweep 087100	18061CNB		PE
1	Meeting Stile 087100	S772BL		PE
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA

1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Door shall be normally closed and locked.
Inactive leaf will be fastened by means of manual flush bolts.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key will activate the concealed switch (alarm).
Rotating the lever handle from the inside will activate the request to exit switch.
Free egress at all times.

Set: 7.0
Doors: 100A
Description: Fail Secure exit device - single

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Electric Power Transfer 087100	EL-CEPT □		SU
1	Electrified Rim Exit, Fail Secure 087100	ED5200A N9905ET M92 ACS □	630	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
1	Surface Closer 087100	DC8210 A11	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
1	Door Bottom 087100	420ASL		PE
1	Sweep 087100	18061CNB		PE
1	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
1	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Switch 281500	3287		SA
1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Doors shall be normally closed and locked.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key over ride will activate the concealed switch (alarm).
Depressing push bar in the path of egress will activate the request to exit switch.
Free egress at all times.
Exit device trim will be locked with loss of power.

Set: 8.0

Doors: 101, 112, 201, 301, 401, 501
Description: Exterior passage function exit device - single

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Rim Exit, Passage 087100	ED5200A N910ET	630	RU
1	Surface Closer 087100	DC8210 A11	689	RU
1	Gasketing 087100	290APK x 2891APK		PE
1	Door Bottom 087100	420ASL		PE
1	Sweep 087100	18061CNB		PE

Set: 9.0
Doors: 106A, 110
Description: Single Exterior door with card reader

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Electric Power Transfer 087100	EL-CEPT □		SU
1	Fail Secure Lock 087100	ML20606 x NAC-SEC NSA ACS □	626	RU
1	Surface Closer 087100	DC8210 A3/ A10 (as required)	689	RU
1	Wall Stop 087100	RM860/ RM861	US26D	RO
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	S773BL		PE
1	Door Bottom 087100	420ASL		PE
1	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
1	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Door shall be normally closed and locked.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key will activate the concealed switch (alarm).
Rotating the lever handle from the inside will activate the request to exit switch.
Free egress at all times.
In the event of an emergency or power failure the door will be locked.

Set: 10.0

Doors: 102, 200, 202, 302, 402, 502
Description: Single Exterior door with card reader

6	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
2	Electric Power Transfer 087100	EL-CEPT □		SU
1	Fail Secure Lock 087100	ML20606 x NAC-SEC NSA ACS □	626	RU
2	Surface Closer 087100	DC8210 A11	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	S773BL		PE
2	Door Bottom 087100	420ASL		PE
1	ElectroLynx Harness - Frame 087100	QC-C1500 □		MK
1	ElectroLynx Harness - Door 087100	QC-CXXX (Size as required) □		MK
1	Wiring Diagram 281500	WD-SYSPK		SA
1	Card Reader 281500	R10SE		HD
1	Power Supply 281500	AQL4-R8E1 □		SU

Notes: Door shall be normally closed and locked.
Authorized entry by valid card read.
Opening the door from the outside by mechanical key will activate the concealed switch (alarm).
Rotating the lever handle from the inside will activate the request to exit switch.
Free egress at all times.
In the event of an emergency or power failure the door will be locked.

Set: 11.0
Doors: 106, 107, 108, 109
Description: Exterior Storeroom single

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Storeroom Lock 087100	ML2057 NSA ACS	626	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
1	Surface Closer 087100	DC8210 A3/ A10 (as required)	689	RU
1	Wall Stop 087100	RM860/ RM861	US26D	RO
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
1	Door Bottom 087100	420ASL		PE

1	Sweep 087100	18061CNB		PE

Set: 11.1
Doors: 802
Description: Exterior Roof Storeroom single

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Storeroom Lock 087100	ML2057 NSA ACS	626	RU
1	Cylinder 087100	complete/ permanent core as req'd	626	RU
1	Surface Closer 087100	DC8210 A11 (as required)	689	RU
1	Threshold 087100	to architect detail		PE
1	Gasketing 087100	290APK x 2891APK		PE
1	Door Bottom 087100	420ASL		PE
1	Sweep 087100	18061CNB		PE

Set: 12.0
Doors: 105
Description: Single privacy with closer

3	Hinge (heavy weight) 087100	TA314/ TA386 (as required) FT	US32D	MK
1	Privacy Lock 087100	ML2030 NSA M19V	626	RU
1	Surface Closer 087100	DC8210 A3/ A10 (as required)	689	RU
1	Wall Stop 087100	RM860/ RM861	US26D	RO
1	Gasketing 087100	S773BL		PE

Set: 13.0
Doors: 113A, 113B, 115, 115A
Description: Cylinder only

1	Cylinder 087100	complete/ permanent core as req'd	626	RU

Set: 14.0
Description: Misc. Tools

1	Crimp Tool 281500	QC-R003 □		MK
1	Test Unit 281500	WT2 □		RU
1	Repair Kit 281500	QC-R001 □		MK

1	Extractor Tool 281500	QC-R002	MK

END OF SECTION 080671

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior standard hollow metal doors and frames.

B. Related Sections:

1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 09 Section "Painting" for field painting hollow metal doors and frames.
3. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.4 WARRANTY

A. The manufacturer shall provide a warranty to the customer that the Products will be free from defects in material and workmanship for a minimum period of 12 months from the date of shipment of the Products.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153/, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.2 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

3. Vertical Edges for Single-Acting Doors: Beveled edge.

a. Beveled Edge: 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.3 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.5 ACCESSORIES

A. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.6 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    b. Compression Type: Not less than two anchors in each jamb.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.7 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory-Applied Paint Finish: Manufacturer's standard, complying with ANSI/SDI A250.3 for performance and acceptance criteria.

2.8 Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
5. In-Place Concrete Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Door Size: Refer to Drawings.

3. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.

a. Finish: No. 4.

4. Frame Material: Same material, thickness, and finish as door.
5. Hinges: Manufacturer's standard.

C. Hardware:

1. Lock: Cylinder.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879, with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

G. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

H. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.

I. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness according to ANSI H35.2.

J. Frame Anchors: Same type as door face.

K. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153 or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.

2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: No. 4.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

F. Aluminum Finishes:

1. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. High speed service doors.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
2. Division 11 Section "Parking Control Equipment" for parking control equipment interlocked to overhead coiling doors.
3. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Qualification Data: For qualified Installer.

E. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer / Products: The following Basis of Design overhead door products are manufactured by Cornell Door Co. Subject to compliance with requirement, provide the specified products by the Basis-of-Design manufacturer or approved equal

1. High Performance Roiling Service Door "Extreme 300" Series, Model EPD 300

B. Source Limitations: Obtain all components of overhead coiling doors, including framing and accessories, from single manufacturer.

2.2 DOOR ASSEMBLY

A. High Speed Service Doors: Overhead coiling door formed with curtain of interlocking metal slats.

B. Operation Cycles: Door components and operators capable of operating for not less than 300,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Design doors of construction for high speed operation to achieve operational speed up to 24 inches per second open and up to 12 inches per second close.

C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Match curtain material and finish.

1. Shape: As indicated on Drawings.
2. Mounting: As indicated on Drawings.

I. Electric Door Operator:

1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
2. Operator Location: Top of hood unless otherwise indicated on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
4. Motor: Manufacturer's standard direct drive type
5. Motor Exposure: Exterior, wet, and humid.

6. Operation:
   a. High performance motor brake - Power electronic dynamic braking with timing optimized solenoid mechanical brake.
   b. Emergency Manual Operation: Chain type.
   c. Overload protection.
7. Obstruction-Detection Device: Automatic photoelectric sensor.
8. Control Station(s): NEMA 4X Wall Mounted Control Panel with operational buttons and self-diagnostic scrolling display messages.
   a. Location: Where indicated on Drawings.
   b. Circuit for activation of warning annunciator when closing.
   c. Lower position sensor.
   d. Absolute encoder for door position monitoring. Mechanical Limit Switches are not accepted.

J. Door Finish: Baked-Enamel or Powder-Coat Finish

2.3 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that project beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Stainless Steel: 0.025-inch- thick, stainless-steel sheet, Type 304, complying with ASTM A 666.
1. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.4 CURTAIN ACCESSORIES

A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

1. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of hood.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, AC or DC.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics: Manufacturer’s standard assembly; ¾ horse power.
2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

G. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.9 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage door openers according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 083326 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.

B. Related Requirements:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer / Products: The following Basis of Design overhead coiling grille products are manufactured by Cornell Door Co. Subject to compliance with requirement, provide the specified products by the Basis-of-Design manufacturer or approved equal

1. Open-Curtain Grille "ESG10."

B. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-grille manufacturer.

2.2 OPEN-CURTAIN GRILLE ASSEMBLY

A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.

B. Operation Cycles: Grille components and operators capable of operating for not less than 50,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Grille Curtain Material: Stainless steel.

1. Rod Spacing: Approximately 2 inches o.c.
2. Link Spacing: Approximately 9 inches apart in a straight in-line pattern.
3. Spacers: Metal tubes matching curtain material.

D. Bottom Bar: Continuous tubular shape, fabricated from aluminum extrusion and finished to match grille.

E. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

F. Hood: Stainless steel.

G. Locking Devices: Equip grille with locking device assembly.

H. Electric Grille Operator:

1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
2. Operator Location: Wall.

3. Motor Exposure: Exterior, wet, and humid.
4. Motor Electrical Characteristics:
   a. Horsepower: 1/2 hp.
5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar .

I. Grille Finish: Stainless-Steel Finish No. 4 (polished directional satin).

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.

1. Stainless-Steel Grille Curtain: ASTM A 666 or ASTM A 240, Type 300 series.

B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.

1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.5 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A 653.
2. Stainless Steel: 0.025-inch- thick, stainless-steel sheet, Type 304, complying with ASTM A 666 or ASTM A 240.
3. Aluminum: 0.040-inch- thick aluminum sheet, complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2.6 LOCKING DEVICES

A. Chain Lock Keeper: Suitable for padlock.

B. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.7 COUNTERBALANCE MECHANISM

A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 MANUAL GRILLE OPERATORS

A. General: Equip grille with manual grille operator by grille manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for grille operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.9 ELECTRIC GRILLE OPERATORS

A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.

1. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.

C. Grille Operator Location(s): Operator location indicated for each grille.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each grille assembly.

1. Electrical Characteristics: Minimum as indicated for each grille assembly. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    a. Self-Monitoring Type: Four-wire-configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbf .

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

L. Emergency-Egress Release: Flush, wall-mounted handle mechanism, for accessibility-code-compliant egress feature, not dependent on electric power. The release allows an unlocked grille to partially open without affecting limit switches to permit passage, and it automatically resets motor drive on return of handle to original position.

M. Self-Opening Mechanism: Automatic release mechanism triggered by fire alarm or power failure. When activated, the grille self-opens by means of a fail-safe operator to the fully open position without the need for power operation or battery backup systems. When the alarm is cleared and power is restored, the grille will operate normally.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.13 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.

B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.

C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Power-Operated Grilles: Install according to UL 325.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.

1. Adjust exterior components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

END OF SECTION 083326

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Glazing.
    e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:
    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Water penetration through fixed glazing and framing areas.
   d. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches .
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch .
   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

C. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .

E. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .
2. Maximum Water Leakage: In accordance with AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STOREFRONT SYSTEMS

A. Basis of Design Manufacturer / Products: The following Basis of Design aluminum-framed storefront products are manufactured by Kawneer North America, an Arconic company. Subject to compliance with requirement, provide the specified product by the Basis-of-Design manufacturer or approved equal.

1. Storefront System, “Trifab VersaGlaze 451T.”

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

A. Basis of Design Manufacturer / Products: The following Basis of Design aluminum-framed storefront products are manufactured by Kawneer North America, an Arconic company. Subject to compliance with requirement, provide the specified product by the Basis-of-Design manufacturer or approved equal.

1. Entrance Door System, “350T Thermal Entrance.”

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Medium stile; 3-1/2-inch nominal width.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide nonremovable glazing stops on outside of door.
4. Finish: Match adjacent storefront framing finish.

2.4 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.5 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected by Architect from manufacturer's full range .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Division 07 Section "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.4 INSTALLATION OF GLAZING

A. Install glazing as specified in Division 08 Section "Glazing."

3.5 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.6 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible. Install as specified in Division 08 Section "Door Hardware."

3.7 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084113

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems: Conventionally glazed.

B. Related Requirements:

1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
2. Division 08 Section "Glazing" for curtain wall glazing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.5 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Water penetration through fixed glazing and framing areas.
   c. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans of greater than 13 feet 6 inches .
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch .

D. Structural: Test in accordance with ASTM E330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .

F. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. .
2. Maximum Water Leakage: In accordance with AAMA 501.1 . Water leakage does not include water controlled by flashing and gutters or water that is drained to exterior.

G. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:

1. Condensation Resistance Factor (CRF):
   a. Fixed Glazing and Framing Areas: CRF for the system of not less than 65 as determined in accordance with AAMA 1503.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.
   a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F .
   b. Low Exterior Ambient-Air Temperature: 0 deg F .

2.2 MANUFACTURERS

A. Basis of Design Manufacturer / Products: The following Basis of Design aluminum-framed storefront products are manufactured by Kawneer North America, an Arconic company. Subject to compliance with requirement, provide the specified product by the Basis-of-Design manufacturer or approved equal.

1. Storefront System, "1600 Wall System 1."

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Clear anodic finish.
5. System: Stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Entrance Door Systems: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts" .

2.4 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

2.5 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

F. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Seal joints watertight unless otherwise indicated.

H. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

J. Install components plumb and true in alignment with established lines and grades.

3.3 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
3. Division 08 Section "Door Hardware" for hardware sets.

D. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in Division 08 Section "Door Hardware Schedule". Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service.

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Ten years for mortise locks and latches.
   2. Five years for exit hardware.
   3. Twenty five years for manual overhead door closer bodies.
   4. Five years for motorized electric latch retraction exit devices.
   5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design Manufacturers: The Basis of Design manufacturers and respective products are as specified herein. Subject to compliance with requirements, provide the Basis-of-Design products or equal products by equal manufacturers.

2.2 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.3 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. For doors with heights more than 60 inches, provide 1 hinge for every 30 inches of door height greater than 60 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0": 4-1/2" standard weight.
   b. Sizes over 3’0" or high frequency: 5" heavy weight.
3. Hinge Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate non-ferrous.
4. Hinge Options: Comply with the following:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Cam Lift Hinges: Where specified provide hinges that move the door up and then lower it to create a tight seal when the door is closed.
6. Manufacturers:

   a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

   a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.4 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

    a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum 10 years' experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer's Standard.

D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

E. Security Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders to be factory keyed.

1. New security key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.

2. Manufacturers:

    a. Corbin Russwin (RU) - Access 3 AS.
    b. Sargent (SA) - Degree DG2.

F. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

G. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

H. Construction Keying: Provide temporary keyed construction cores.

I. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.8 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.

2.9 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty, High Security Monitoring): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.

4. Manufacturers:

   a. Corbin Russwin Hardware (RU) - ML20600 NAC Series.
   b. Sargent Manufacturing (SA) - NAC 8200 Series.

B. Electromechanical Mortise Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
2. Manufacturers:

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.

3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
4. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED5000 Series.
   b. Sargent Manufacturing (SA) - 80 Series.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
   1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
   2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
   3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
   4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
   5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
   6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
   1. Manufacturers:
      a. Corbin Russwin Hardware (RU) - DC8000 Series.
      b. Norton Door Controls (NO) - 7500 Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

   1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
   2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.15 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
1. Manufacturers:
   a. Rixson Door Controls (RF).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Sargent Manufacturing (SA).

2.16 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.17 ELECTRONIC ACCESSORIES

A. Wiegand Test Unit: Test unit verifies proper Wiegand output integrated card reader lock installation in the field by testing for proper wiring, card reader data integrity, and lock functionality including lock/unlock, door position, and request-to-exit status. 12 or 24VDC voltage adjustable operating as Fail Safe or Fail Secure.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - WT2 Wiegand Test Unit.
   b. Sargent Manufacturing (SA) - WT2 Wiegand Test Unit.
   c. Yale Commercial(YA) - WT2 Wiegand Test Unit.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:
   a. Securitron (SU) - AQL Series.

2.18 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
2. Submit documentation of incomplete items in the following formats:
   a. PDF electronic file.
   b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and

missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Division 08 Section "Door Hardware Schedule", for hardware sets.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for windows, doors, storefront framing and glazed curtain walls.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Division 08 Section "Mirrors."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg. F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
6. Leakage: Shall be determined in accordance with NFRC 400, not to exceed:

a. Glazed Swinging Entrance Doors: 1.0 cfm/ft2
b. Curtainwall & Storefront Glazing: 0.06 cfm/ft2

2.2 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

C. Thickness: Where glass thickness is indicated, it is a minimum.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations or as selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

G. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

I. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

Mark	**Location**	**Unit Thickness**	**Profile**	**Assembly Max U**	**Assembly Max SHGC/Min. VT/SSHGC**
1	Curtain Wall and Windows - Tempered	1” vision	OB: 1/4"; “Solarban 60”; TP AS: 1/2" air fill IB: 1/4" clear TP	0.42	0.40/1.10
2	Windows (non-tempered)	1” vision	OB: 1/4"; “Solarban 60”; low-E coating on #2 face; HS AS: 1/2" air fill IB: 1/4" clear HS	0.42	0.40/1.10
3	Aluminum Framed Entrances, Storefronts and Vestibules	1”	OB: 1/4" clear TP AS: 1/2" air fill IB: 1/4" clear TP	0.42 Doors: 0.77	0.40/1.10

Legend:

OB: Outer Board Glass
AS: Air Space
IB: Inboard Glass
HS: Heat Strengthened
TP: Tempered

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Annealed monolithic silvered glass mirrors.

B. Related Sections:

1. Division 10 Section "Toilet Room Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

D. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503.

B. Clear Glass: Mirror Glazing Quality.

1. Nominal Thickness: 3.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.

3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Edge Treatment: Flat polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
2. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A 653, G40, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645.

1. Steel Studs and Tracks:
   a. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection 0.0179 inch.
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.
2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0179 inch.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Steel Thickness: 0.0179 inch.
2. Depth: As indicated on Drawings.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, and 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, in size indicated on Drawings 1 by 3/16 inch by length indicated.

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings 2-1/2 inches.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: As required by horizontal deflection performance requirements 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: As required by horizontal deflection performance requirements 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Division 06 Section "Sheathing" for gypsum sheathing for exterior walls.
2. Division 07 Section "Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Division 09 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
4. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Gypsum ceiling board.
4. Gypsum board, Type C.
5. Gypsum board, Medium Grade Abuse-Resistant.
6. Interior trim.
7. Joint treatment materials.
8. Sound-attenuation blankets.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396.

1. Thickness: As shown on drawings.
2. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C1396.

1. Thickness: As shown on drawings, no less than 5/8 inch.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C1396.

1. Thickness: As shown on drawings.
2. Long Edges: Tapered.

D. Mold-Resistant Gypsum Board: ASTM C1396. With moisture- and mold-resistant core and paper surfaces.

1. Core: As indicated.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

A. Water-Resistant Gypsum Backing Board: ASTM C 630 or ASTM C 1396.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C1396. Manufactured to have increased fire-resistive capability.

1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
2. Long Edges: Tapered.

B. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.

1. Provide abuse resistant Classification Level 2 gypsum board with the following characteristics;
2. Maximum Abrasion Depth – 0.59”
3. Maximum Indentation Depth – 0.100”
4. Minimum Fracture Energy Soft Body – 195 ft/lbf
   Minimum Fracture Energy Hard Body – 100 ft/lbf
5. Core: As indicated on Drawings.
6. Long Edges: Tapered.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

C. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Mold-Resistant Type: As indicated on Drawings wet areas.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Type C: As indicated on Drawings Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    a. Primer and its application to surfaces are specified in Division 09 Section "Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Stone thresholds.
3. Tile backing panels.
4. Metal edge strips.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Module Size: Actual tile size plus joint width indicated.

C. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.60.
2. Step Treads: Minimum 0.60.
3. Ramp Surfaces: Minimum 0.80.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproof membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturers / Products: Subject to compliance with requirements, provide products indicated on Finish Schedule on Drawings and as noted below, or equal products and manufacturers.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. Glazed Wall Tile (WT1)

1. Composition: Ceramic.
2. Face Size: Refer to Finish Schedule.
3. Thickness: Per manufacturer.
4. Face: Plain with modified square edges or cushion edges.
5. Finish: Gloss.
6. Tile Manufacturer, Color and Pattern: Refer to Finish Schedule.
7. Grout Color: As selected by Architect from manufacturer's full range.

B. Tile Type (FT1): Unglazed porcelain ceramic tile.

1. Basis of Design Manufacturers and Products: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or approved comparable product.
2. Face Size: Refer to Finish Schedule.
3. Thickness: 3/8 inch, unless otherwise indicated.
4. Face: Plain with square or cushion edges.
5. Finish: Refer to Finish Schedule.
6. Dynamic Coefficient of Friction: Not less than 0.60 where shown (FT1E).
7. Tile Color and Pattern: As indicated by manufacturer's designations.
8. Grout Color: Match Architect's sample or as selected by Architect from manufacturer's full range.

C. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as adjoining wall tile.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Acceptable Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. USG Corporation; DUROCK Cement Board.

2. Thickness: 1/2 inch.

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work manufactured by Laticrete International, Inc. or by one of the following or equal:

a. Bonsal American; an Oldcastle company.
b. MAPEI Corporation.
c. TEC; a subsidiary of H. B. Fuller Company.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

a. For oversize wall tile applications provide “255 MuiltMax” by Laticrete International, Inc. or equal.

B. Organic Adhesive: ANSI A136.1, Type I.

1. Basis of Design Manufacturer: Subject to compliance with requirements, provide products that may be incorporated into the Work manufactured by Laticrete International, Inc. or by one of the following or equal:

a. Bonsal American; an Oldcastle company.
b. MAPEI Corporation.
c. TEC; a subsidiary of H. B. Fuller Company.

2.7 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Standard Cement Grout: ANSI A118.6.

1. Basis of Design Manufacturer: Subject to compliance with requirements, provide products that may be incorporated into the Work manufactured by Laticrete International, Inc. or by one of the following or equal:

a. Bonsal American; an Oldcastle company.
b. MAPEI Corporation.
c. TEC; a subsidiary of H. B. Fuller Company.

C. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work manufactured by Laticrete International, Inc. or by one of the following or equal:

a. Bonsal American; an Oldcastle company.
b. MAPEI Corporation.
c. TEC; a subsidiary of H. B. Fuller Company.

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:

a. Bonsal American; an Oldcastle company; Grout Sealer.
b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
c. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
d. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch.
2. Glazed Wall Tile: 1/16 inch.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
2. Do not extend waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.

I. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Masonry or Concrete:

1. Tile Installation W202: Thin-set mortar; TCNA W202.

a. Tile Type: Wall Tile as Scheduled or approved.
b. Thin-Set Mortar: Latex- portland cement mortar.
c. Grout: As recommended by manufacturer.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation: Cementitious bond coat on gypsum board; TCNA W243.

a. Tile Type: Wall Tile as Scheduled or approved.
b. Cementitious Bond Coat: For ceramic tile, ANSI A118.1 or better; for porcelain tile, ANSI A118.4 or better.
c. Grout: As recommended by manufacturer.

2. Tile Installation: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCNA W244.

a. Tile Type: Wall Tile as Scheduled or approved.
b. Thin-Set Mortar: Latex- portland cement mortar.
c. Grout: As recommended by manufacturer.

3. Tile Installation: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board; TCNA W245.

a. Tile Type: Wall Tile as Scheduled or approved.
b. Thin-Set Mortar: Latex- portland cement mortar.
c. Grout: As recommended by manufacturer.

C. Interior Floor Installations, Concrete:

1. Tile Installation: TCNA F113; on-ground, thinset mortar.

a. Tile Type: Floor Tile as Scheduled or approved.
b. Thinset Mortar: Modified dry-set mortar.
c. Grout: As recommended by manufacturer.

2. Tile Installation: TCNA F122A; above ground, thinset mortar on waterproof membrane.

    a. Tile Type: Floor Tile as Scheduled or approved.
    b. Thinset Mortar: Modified dry-set mortar.
    c. Grout: As recommended by manufacturer.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical panels and exposed suspension systems for ceilings.

B. Related Sections

1. Division 09 Section "Joint Sealants" for acoustical sealants as part of the acoustical ceiling assembly.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of full-size samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS (ACT1)

A. Basis-of-Design Manufacturer / Product: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or equal product.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 1, nodular; with washable vinyl-film overlay.

C. Color: White.

D. Thickness: As indicated on Finish Schedule on Drawings.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Basis-of-Design Manufacturer / Product: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or equal product.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled expansion anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

F. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.4 METAL SUSPENSION SYSTEM

A. Wide-Face, Capped, Double-Web, Steel Suspension System (SS1): Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements provide edge moldings from same manufacturer as suspension system.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 ACOUSTICAL PANEL INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.
2. Rubber stair accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than , in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturers / Products: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or equal product.

2.2 THERMOPLASTIC-RUBBER BASE (B1)

A. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.

B. Thickness: 0.125 inch.

C. Height: As indicated on Drawings.

D. Lengths: Cut lengths 48 inches long.

E. Outside Corners: preformed.

F. Inside Corners: preformed.

G. Colors: Refer to Finish Schedule.

2.3 RUBBER STAIR ACCESSORIES (RS1)

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Stair Treads: ASTM F 2169.

1. Type: TS (rubber, vulcanized thermoset).
2. Class: 2 (pattern; embossed, grooved, or ribbed).
3. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
4. Nosing Height: 48 mm.
5. Thickness: 1/4 inch and tapered to back edge.
6. Size: Lengths and depths to fit each stair tread in one piece.
7. Integral Risers: Smooth, flat; in height that fully covers substrate.

C. Locations: Provide rubber stair accessories in areas indicated.

D. Colors and Patterns: As indicated by manufacturer's designations.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Tightly adhere to substrates throughout length of each piece.
2. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat(s).

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.
2. Vinyl composition floor tile, static dissipative.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Full-size units of each color, texture, and pattern of floor tile required.

C. Samples for Initial Selection: For each type of floor tile indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Static Dissipation at 12% RH: Flooring in combination with a person wearing dissipative footwear - 1000 to 100 volts: 0.2 seconds maximum.

2.2 SOLID VINYL FLOOR TILE (VT1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Patcraft; a division of Shaw Industries, Inc; per Finish Schedule or equal product by one of the following or equal:

1. Mannington Mills, Inc.
2. Roppe Corporation; Roppe Holding Company.
3. VPI Corporation.

B. Tile Standard: ASTM F 1700.

1. Class: Class I, Monolithic Vinyl Tile.
2. Type: A, Smooth Surface.

C. Thickness: 0.125 inch.

D. Size: 12 by 12 inches.

E. Seamless-Installation Method: Heat welded.

F. Colors and Patterns: As indicated by manufacturer's designations.

2.3 VINYL COMPOSITION FLOOR TILE (VCT1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Flooring, Inc.; per Finish Schedule or equal product by one of the following or equal:

1. Congoleum Corporation.
2. Johnsonite; a Tarkett company.
3. Armstrong Flooring, Inc.

B. Tile Standard: ASTM F 1066, Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As indicated by manufacturer's designations.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
   a. Colors: Match floor tile .

D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Verify use of polish with manufacturer recommendations. Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 099123 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following substrates:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Gypsum board.

B. Related Requirements:

1. Division 05 Sections "Metal Fabrications" for shop priming metal fabrications, stairs and railings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturers and Products: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or equal product.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.
4. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
   a. Uninsulated metal piping.
2. Paint the following work where exposed in occupied spaces:
   a. Uninsulated metal piping.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces (SC1): Low Traffic Interior Concrete Floors

1. Concrete Hardner: Single-application densifier-hardner; refer to Finish Schedule.
   a. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

B. CMU Substrates (P3):

1. Institutional Low-Odor/VOC Latex System MPI INT 4.2E:
   a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

C. Galvanized Steel Substrates: Exterior Galvanized Metals

1. Water Based Light Industrial System MPI EXT G :
   a. Prime Coat: Primer, galvanized, water based, MPI #134. Provide the following or approved equal:
      1) "Pro-Cryl Universal Primer" by Sherwin Williams
      2) "Ultra Spec HP Acrylic Metal Primer" by Benjamin Moore
   b. Topcoat: Acrylic, one component, gloss (MPI Gloss Level 5), MPI #163. Provide the following or approved equal:
      1) "DTM Acrylic Semi-Gloss by Sherwin Williams, or equal
      2) "Ultra Spec HP D.T.M. Acrylic Gloss Enamel" by Benjamin Moore

D. Steel Substrates (DP1, SP1): Railings, Doors and Door Frames

1. Latex System over Shop-Applied Quick-Drying Shop Primer System MPI INT 5.1X:
   a. Prime Coat: Prime Coat: Primer, quick dry, for shop application, MPI #275.
   b. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

E. Galvanized-Metal Substrates: Interior Galvanized Metals

1. Latex System MPI INT 5.3J:
   a. Prime Coat: Primer, galvanized, water based, MPI #134.
   b. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

F. Gypsum Board Substrates (P1 – P2, CP1):

1. Latex over Latex Sealer System MPI INT 9.2A:
   a. Intermediate Coat: Latex, interior, matching topcoat.
   b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
   c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

END OF SECTION 099123

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout Characters : Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Character Material: Sheet or plate stainless steel.
2. Character Height: As indicated on Drawings.
3. Thickness: Manufacturer's standard for size of character.
4. Integral Stainless-Steel Finish: As selected by Architect from full range of industry finishes.
5. Mounting: Projecting studs.
6. Font Type: To be selected by Architect.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
2. Sign Mounting Fasteners:

    a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
    b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.6 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. As Approved by Architect: Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.

2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes room-identification signs that are directly attached to the building.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size Sample.
2. Full-size Samples, if approved, will be returned to Contractor for use in Project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.

    a. Composite-Sheet Thickness: 0.125 inch.
    b. Surface-Applied Graphics: Applied vinyl film.
    c. Color(s): As selected by Architect from manufacturer's full range.

2. Sign-Panel Perimeter: Finish edges smooth.

    a. Edge Condition: Square cut.
    b. Corner Condition in Elevation: Square.

3. Mounting: Surface mounted to wall with adhesive or two-face tape.
4. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range.

2.3 SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

C. Adhesive: As recommended by sign manufacturer.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.2 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 101440 PARKING GARAGE SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Directional signs for the interior of the garage.
2. Pedestrian messaging and non-illuminated life safety signs for the interior of the garage.
3. Illuminated exterior characters.
4. Signage accessories.

B. Related Sections:

1. Division 26 Sections for electrical service and connections for illuminated characters and for access to remote transformers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, Braille layout, graphic elements, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:

1. Panel Signs: Full-size Samples of each type of sign required.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
4. Approved samples will not be returned for installation into Project.

E. Sample Sign: Upon final selection and verification of materials, color and graphics, submit a fully fabricated sample of a typical sign to the Architect for final approval prior to full fabrication.

F. Qualification Data: For Installer.

G. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where dimensions of surfaces on which they are installed determine sizes of signs, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.
2. Coordinate anchorage location and depth with precast concrete manufacturer.

B. Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of Work. All electrical supply components including but not limited to, junction boxes, transformers and conduit, shall not be visible from the building exterior.

1.7 WARRANTY

A. Provide written five-year full replacement warranty to Owner that all signage will be free of defects due to workmanship or materials including but not limited to fading, peeling, delaminating and installation.

B. Without additional cost to Owner, repair any defects that develop during warranty period, vandalism excepted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Signs shall be reflectorized sheeting, reverse silk screened, all in accordance with sign schedule noted on the Drawings.

1. Signs shall be aluminum sheet alloy, minimum 0.080 in. thick, for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B209 for 5005-H15.
2. Sign background colors as noted in drawings shall be silk-screened over roller-applied reflective sheeting background
   a. Acceptable Product: 3M Engineer Grade "Scotchlite #3290" reflective sheeting, or equal.
3. Reflective symbols and text shall be reverse-stenciled resulting from background color application over reflective sheeting.
4. Alternative process other than silk screening shall not be acceptable without prior approval from the Owner and Architect.
5. Finished sign surface shall provide smooth and seamless interface between applied layers.

B. Sign Faces: Reflective sheeting shall be that required by Sections 633.05 and 718.01 of FHWA "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" FP-96.

C. Fasteners: Use tamperproof fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

D. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

E. Sign Supports: Structural Steel (ASTM A-36, galvanized), or Aluminum or as shown in the construction documents.

F. Front-lit LED Channel Letters: 3/16-inch acrylic face in colors noted on drawings. Prefinished 0.040-inch aluminum returns in color noted on drawings with high reflective white interior. Aluminum trim cap and back colors noted on drawings.

2.2 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.3 ALUMINUM FINISHES

A. Class II Clear Anodic Finish: Manufacturer's standard clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish.

B. Fabricate aluminum signs five feet or more in length with adequately sized full-length steel stiffener.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, and electrical power provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

C. Bracket-Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

D. Illuminated Characters:

1. Run wires into wall construction through conduit.
2. Exposed-to-view wiring or conduit on wall face is not permitted.
3. Engage a licensed electrician to connect wiring to power source.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer’s written instructions.

B. Protect signs from damage until acceptance by Owner.

END OF SECTION 101440

SECTION 102800 - TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Toilet accessories as shown and scheduled.
2. Miscellaneous accessories.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for concealed metal strapping to support accessories.
2. Division 08 Section "Mirrors" for frameless mirrors.

1.3 QUALITY ASSURANCE

A. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper anchorage, operation and servicing or accessory units.

B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in other work and coordinate their delivery to avoid delay.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas.

D. Code Requirements: Provide grab bars of types, capable of sustaining loads, as required by authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, catalogue cuts and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

C. Samples: Submit samples of toilet accessories as requested by Architect.

1.5 SYSTEM PERFORMANCE

A. Grab bars in handicap toilets shall be capable of supporting 250 pounds for 5 minutes. Reinforce support system to achieve great rigidity so that glass wall panels do not break.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver accessories to the site, ready for use, in the manufacturer's original and unopened containers and packaging, bearing labels as to type or material, manufacturer's name and brand name.

B. Store and handle accessories in accordance with manufacturer's instructions.

C. Remove materials which are disfigured, scratched or not suitable and replace with new materials.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, rods, shapes, forgings, and flat products with finished edges.

C. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B456, Type SC 2.

D. Galvanized Steel Sheet: ASTM A527, G60.

E. Fasteners, General: No exposed fastening devices permitted on exposed frames.

1. Exposed Fasteners: Match finishes on which they are being used.
2. Concealed Fasteners: Galvanized or cadmium plated.

2.2 MANUFACTURERS

A. Basis-of- Design Manufacturers and Products: The Basis-of-Design manufacturers and products are listed on the Toilet Accessory Schedule on Drawings. Subject to compliance with requirements provide the Basis-of –Design products.

1. Additional manufacturers offering products that may be incorporated into the Work include, but are not limited to the following or equal.
   a. American Specialties, Inc.
   b. Bradley Corp.

2.3 FABRICATION

A. Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable.

B. Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 111200 - PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Parking access control system including in-ground detector loops, software and subsystems.
2. Automatic Barrier Gates (AG)
3. Vehicle Detectors and Detector Loops (DL)
4. Motion Detectors (MD)
5. Intercom Stations (IS)
6. Intercom Master (IM)
7. Facility Management Software (FMS)
8. Extended Warranty Services
9. Cloud-Based Services

1.3 DEFINITIONS

A. List of abbreviations:

AG	Automatic Barrier Gate		ODBC	Open Database Connectivity
AVIR	Automatic Vehicle Identification Reader		OLVS	On-Line Validation System
BS	Barcode/QR Scanner		PA DSS	Payment Application Data Security Standard
CMS	Count Monitoring Software		PARCS	Parking Access and Revenue Control System
DL	Detector Loop		LPR	License Plate Recognition
DVU	Desktop Validation Unit		MD	Motion Detector
EMV	Europay, MasterCard, and Visa		ODBC	Open Database Connectivity
ES	Entry Station		OLVS	On-Line Validation System
EPSS	Event Parking Software Subsystem		PA DSS	Payment Application Data Security Standard
EPS	Exit Pay Station		PARCS	Parking Access and Revenue Control System
FMS	Facility Management Software		PBC	Pay-by-Cell Subsystem
GOS	Garage Occupancy Sign		PCI	Payment Card Industry
GUI	Graphical User Interface		PCI DSS	Payment Card Industry Data Security Standard
IM	Intercom Master		PMA	Pedestal Mounting Arm
IS	Intercom Station		POF	Pay-on-Foot
IRW	Image Review Workstation		RFID	Radio Frequency Identification
LAT	Lane Acceptance Test		RSA	Remote System Access
LED	Light Emitting Diode		RCS	Revenue Control Software
LPD	License Plate Database		TCP/IP	Transmission Control Protocol/Internet Protocol
LPN	License Plate Number		VoIP	Voice over Internet Protocol
LPR	License Plate Recognition		WHBS	Wireless Handheld Barcode Scanner
MD	Motion Detector			

1.4 SYSTEM DESCRIPTION

A. The system will control access to the Union County Elizabethtown Garage. The garage users will be non-transient, Union County employees. There will be no visitor or transient parking. The system will utilize RFID technology to activate both the roll-down security gates and the Automatic Barrier Gates (AG) at the Elizabethtown Plaza, and Caldwell Place entries and the roll-down security gate in the nested judges' parking area on the eighth level of the garage. During normal work hours for the County, the roll-down security gates at the garage entrances will be open, and County parkers will enter the garage and their AVI tag will vend the gate allowing entry. At the eighth level of the garage, there is a nested area for judges, controlled by a roll-down security gate. Judges wishing to enter the nested area will approach the roll-down security gate, and their AVI tag will vend the roll-down security gate allowing entry to the nested area.

B. During those times when the garage is closed and there is a need for authorized parkers to gain access, the system will utilize a Motion Detector (MD) / "virtual loop" at the entrances of the garage to detect the authorized vehicle, and the RFID system will read the parker's AVI tag and vend the roll-down security gate to access.

C. The objectives of the Parking Access Control System Project include, but are not limited to, the following:

1. Supply and install a new and complete Parking Access Control System, including in-ground detector loops and related hardware, software & subsystems as defined herein.
2. System Wiring: All system control and communication wiring shall be provided new, as required and recommended by Vendor and/or Parking Access Control System manufacturer. All equipment power will be provided for the Vendor by Others. All communication / low voltage wiring shall be provided and pulled by the vendor using conduit provided by Vendor.
3. Prior to mounting equipment indicated herein with anchor bolts or expansion anchors and saw cutting DL's, Vendor is responsible for field verifying all existing reinforcement in concrete slabs and islands. Use of Ground Penetrating Radar (GPR) or other non- destructive means are acceptable. Do not damage existing rebar in concrete slabs and islands.
4. The Parking Access Control System shall be designed with an open architecture in order to provide integration to third party applications as required.
5. Provide mechanisms to strengthen internal controls and management tools for the system.
6. Provide flexibility in offering new capabilities to promote parking and other services in a web-enabled environment.
7. Provide a system that accurately tracks and reports parking facility occupancy and statistical information, and increases the efficiency of the operation and maintenance of the hardware and software.
8. Ensure flexibility and scalability for any future need to update, upgrade, and/or expand the system.
9. Provide an intuitive and user-friendly interface for the Owner and its personnel.

D. Optional Maintenance Agreement: A maintenance contract for on-going warranty and maintenance services after the Warranty period (24 months) may be negotiated by the Owner with the selected Vendor. The contract would be directly with the Owner.

E. Optional Hosted Cloud-Based Services: Contractor shall provide cost for hosting Cloud Based solution for Parking Access Control System for 3 years.

F. The parking and other control equipment components provided by the Vendor shall operate as a complete system. Each equipment component shall perform its function in relation to other components. As such, each component shall be compatible with all related components. All components shall be compatible with the geometric circumstances of the facility or installation location.

G. The Vendor shall bring any deficiencies or discrepancies in these specifications that they believe may exist to the attention of the Owner or Owner's Representative. No deficiency or discrepancy in these

Specifications shall relieve the Vendor of the responsibility to provide a satisfactorily performing, reliable system.

H. The Parking Access Control System shall be installed at the Union County Elizabethtown Parking Garage located in Elizabeth, NJ. One entry and exit lane and one reversible lane of the garage are located at the Caldwell Place, and one entry and exit lane of the garage are located at the Elizabethtown Plaza.

I. The Parking Access Control System shall be used for the management and control of the following parking user groups:

1. Permit/Monthly Parking: Parking control system shall be used to control the access to the garage for County employees only.

J. Parking Access Control System Lane Configurations by Facility:

PARKING EQUIPMENT LANES BY FACILITY – Refer to Drawings (attached)

Union County Elizabethtown Parking Garage	Number of Lanes		
	Entry Lanes	Exit Lanes	Total
Caldwell Place (1 Reversible Lane)	2	2	4
Elizabethtown Plaza	1	1	2
Judges Nested Area	1	1	2
Total			8

K. Parking Access Control System Equipment Matrix:

PARKING EQUIPMENT QUANTITIES BY LOCATION – Refer to Drawings (attached)

Union County Elizabethtown Parking Garage	Equipment Schedule							
	AG	AVIR	DL	MD	IS	PMA	IM	FMS
Caldwell Place (1 Reversible Lane)								
Entry Lane #1	1	1	2	0	1	1	0	0
Entry Lane #2	1	1	2	1	1	1	0	0
Exit Lane #3	1	1	2	0	1	1	0	0
Exit Lane #4	1	1	2	0	1	1	0	0
Sub Total	4	4	8	1	4	4	0	0
Elizabethtown Plaza								
Entry Lane #5	1	1	2	1	1	1	0	0
Exit Lane #6	1	1	2	0	1	1	0	0
Sub Total	2	2	4	1	2	2	0	0
Judges Nested Area								
Entry Lane #7	0	1	2	0	1	1	0	0
Exit Lane #8	0	1	2	0	1	1	0	0
Sub Total	0	2	4	0	2	2	0	0
Parking Office (Total)	0	0	0	0	0	0	1	1
TOTAL	6	8	16	2	8	8	1	1

Legend	
AG: Automatic Barrier Gate	IS: Intercom Station
AVIR: Automatic Vehicle Identification Reader	IM: Intercom Master
DL: Detector Loop	FMS: Facility Management Software
MD: Motion Detector	PMA: Pedestal Mounting Arm

1.5 PERFORMANCE REQUIREMENTS

A. System, including all specified features, shall be fully operational when system is turned over to the Owner for testing and acceptance.

B. Thermal Movements: Provide parking control equipment that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.6 SUBMITTALS

A. Product Data: Provide Product Data for all Hardware (including Parking Access Control System Servers if proposed), Software and ancillary products that have been proposed to meet these Functional Specifications.

1. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Detail equipment assemblies and indicate dimensions, required clearances, and method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: Power, communication and control wiring.
3. Equipment Layout Drawings: Dimensioned drawings for the location of all parking equipment and subsystems proposed.

B. Field quality-control test reports.

C. Manuals: Provide Manuals for the following:

1. Parking Access Control System User Manuals.
2. Parking Access Control System subsystems Manuals.
3. Maintenance Manuals.
4. Training Manuals – including workbooks, lecture notes/overheads, and manuals to be used in live training sessions to include the following:
    a. Managers Manual
    b. Supervisors Manual
    c. Systems Administration Manual
    d. Failover/fallback Manual
    e. Maintenance Manual

D. Backup Plan: Provide a system Backup Plan that includes step-by-step procedures that are recommended by the manufacturer for backup and data recovery should a system failure occur. These procedures shall be comprehensive and define specific Vendor and Owner responsibilities.

E. Testing Plan: Provide testing procedures for all system functionalities that are described in these Functional Specifications as well as any other functionalities performed by the system (e.g. standard functionalities for the Parking Access Control System) that are not specifically described within these Functional Specifications. The Testing Plan shall be submitted for review a minimum of thirty (30) calendar days prior to a required test. Comments will be returned to the Vendor by the Owner or Owner's Representative and shall be incorporated into the final plan. No test shall commence until the finalized plan is received by the Owner or Owner's Representative. The Vendor shall develop all test procedures for the tests that are listed below:

1. Lane Acceptance Test (LAT)

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours normal travel time from Installer's place of business to Project site.

B. Source Limitations: Obtain parking control equipment through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Pre-installation Conference: Conduct conference at Project site at a time convenient with the Owner and Owners Representative's.

1.8 TRAINING

A. The Vendor shall provide Hardware and Software Training prior to turnover of the new Parking Access Control System to the Owner. On-site training for Owner and Owner's Representative personnel shall be provided by qualified training staff of the Parking Access Control System manufacture or authorized installer. Vendor shall provide a minimum of eight (8) hours of separate training sessions, twenty-four (24) total hours, tailored for each of the following job classifications:

1. Managers
2. Supervisors
3. Auditing Department
4. Maintenance Staff.

B. At least one (1) week prior to the scheduled training sessions, Vendor shall provide system use/training manuals for reference for each session type.

1.9 ACCEPTANCE TESTING

A. Vendor shall perform Acceptance Testing to verify the functional performance of the Parking Access Control System and its components to ensure adherence to these Functional Specifications. The Acceptance Testing process shall not take away from or reduce the responsibility of the Vendor to provide a finished and fully functioning system that meets all requirements of these Functional Specifications. Acceptance Testing of the Parking Access Control System shall include the following:

1. Lane Acceptance Test (LAT)
   a. LAT's are to be conducted as a demonstration to the Owner or Owner's Representative that the installed equipment complies with these Functional Specifications, the Contract, the Vendor's product data, and to other documentation, such as user manuals.
   b. When installation has been completed for a location/lane, the Vendor shall conduct its own internal testing of the installed equipment prior to scheduling a test with the Owner or Owners Representative.
   c. Upon successful completion of the Vendor's internal testing, the Vendor shall schedule a LAT with the Owner or Owners Representative to verify equipment/system performance.

d. LAT's shall be conducted for each Parking Access Control System entry lane, exit lane, shall include tests of Parking Access Control System equipment and software. The Vendor shall not activate the system for service until all LATs have been successfully completed for each lane or device and the Owner has notified the Vendor that it is ready to put the equipment into operation.

e. The Vendor shall provide test procedure documents for LAT's as part of the Testing Plan in accordance with the Submittal guidelines. LAT testing procedures shall include the following sections:
   1) Narrative describing the general procedures to be followed;
   2) Definition of all minor and major deviation types;
   3) Checklist of all items necessary to conduct the test (e.g. Parking Access Control System devices);
   4) Checklist for the components of each Parking Access Control System equipment location;
   5) Signature page for all LAT participants' signatures;
   6) Step by step instructions for testing each functionality;
   7) Tests for verifying the reporting requirements;
   8) Area within each test section to denote "pass" or "fail"; and i. section for listing and describing test deviations.

f. The Vendor shall provide all ancillary items necessary to complete the LAT's for testing purposes. In addition, the Vendor shall make available sufficient personnel to perform the LAT in an efficient and timely manner.

g. The LAT shall be considered successfully completed when all components have passed their respective test procedures and all test documents have been signed by the Owner and Vendor. Minor deviations resulting in the creation of punch list items shall not be considered grounds for failure of the overall LAT. Major deviations found during the LAT shall result in the retest of the lane or device.

h. Minor deviations are any failure that does not affect system functionality, exception count accuracy, or report accuracy.

i. Major deviations are any failures that affect system functionality, exception count accuracy, or report accuracy.

2. Punch List
   a. Starting with the beginning of installation through Final System Acceptance, the Vendor shall submit a document on a weekly basis showing the status of all outstanding system issues, regardless of severity, including the plan for resolution and estimated completion date.
   b. All deviations noted during acceptance testing shall be recorded on the Punch List.

3. Final System Acceptance
   a. Final System Acceptance will be submitted by the Owner or Owner's Representative, in writing to the Vendor, upon successful completion of all acceptance tests, and upon verification by the Owner of complete resolution of all outstanding items on the Punch List.

1.10 WARRANTY

A. Vendor shall provide Warranty services including all parts, materials, labor, and workmanship following Vendor's receipt of Final System Acceptance by the Owner or Owner's Representative, for a period of twenty-four (24) consecutive months. All work including parts, labor, maintenance, repairs, travel time, expenses, etc. that are incurred during the Warranty period shall be provided without additional cost to the Owner.

   1. Warranty Hours – 8:00 AM through 6:00 PM, M - F

B. Vendor shall provide quarterly Preventative Maintenance services on all hardware and software installed as part of the Warranty services.

C. Vendor shall provide Hourly Service Rates for any Owner approved Warranty services that are performed outside the Warranty Hours. There shall be no cost to the Owner for any defective parts, devices, components and systems that are replaced during the Warranty period.

D. Excluded from the Warranty are costs for repair or replacement of any parts, devices, components and systems that have been damaged or rendered unserviceable due to misuse, abuse, vandalism, negligence or due to Acts of God. Any such repairs or replacements shall be pre-approved by the Owner and performed by the Vendor at the service rates proposed for outside Warranty Hours service plus material costs.

E. The Warranty period shall begin following Vendor's receipt of Final System Acceptance by the Owner or Owner's Representative. Vendor shall maintain all systems that are operating prior to starting, and throughout, the Warranty period at no cost to the Owner or Owner's Representative. Maintenance services shall be as defined within the Manufacturer's recommended maintenance procedures manual. Quarterly Preventative Maintenance services shall be performed and included as part of the warranty and completed at non-peak periods during normal business hours.

F. Software Support during the Warranty Period:

1. Vendor shall make available to the Owner or Owner's Representative normal Parking Access Control System software improvement releases (updates) when they become available. Where Parking Access Control System software problems are identified and are agreed to be minor, that is not affecting revenue, reporting, or the entry/exit or payment functionalities, these problems shall be corrected in a new Parking Access Control System software release and provided to the Owner as soon as available from the manufacturer. All upgrades or improvements to Parking Access Control System software shall be documented and approved, prior to implementation. The Vendor shall correct major Parking Access Control System software problems immediately on a priority basis. Major Parking Access Control System software problems are defined as those causing erroneous financial transactions, revenue loss, reporting errors, loss of entry/exit functionality, loss of payment functionality, system instability, database corruption and compromised operational efficiency. Where Parking Access Control System software problems are identified and are agreed to be major, these problems shall be corrected in a new Parking Access Control System software release to be available to the Owner within five (5) calendar days of notification.
2. Software Support Services shall include, but are not limited to, the following:
    a. On-Site Software Support for both Parking Access Control System and all 3rd party software applications.
    b. Remote Software Support for both Parking Access Control System and all 3rd party applications.
    c. 24/7 Hotline Telephone Support.
3. All Parking Access Control System software patches and updates shall be provided free of charge during the Warranty period. Prior to all Parking Access Control System software modifications, patches, updates, and upgrades, Vendor shall provide accurate and complete documentation to the Owner that describes:
    a. Patch/Update release designation.
    b. Proposed date and time of implementation.
    c. Detailed description of what the patch/update accomplishes.
    d. Full disaster recovery procedures that return the system to its pre-patch update condition.
    e. List of other installations where the patch has been previously installed, and contact information for those customers.
4. Vendor shall coordinate the testing and implementation of all patches and updates with the Owner or Owner's Representative.
5. Vendor shall coordinate all remote and physical access into the servers with the Owner or Owner's Representative.
6. The Vendor shall commit to provide corrective patches and upgrades in the event security vulnerability or system availability issues are discovered within fifteen (15) business days of discovery.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following or equal:

1. Parking Control Equipment Manufacturer & Installer:
   a. Amano McGann
   b. DESIGNA USA, Inc.
   c. FlashParking
   d. HUB Parking
   e. Sentry/SKIDATA
   f. TIBA Parking Systems
2. Automatic Vehicle Identification Reader (AVIR):
   a. Nedap
   b. TagMaster
   c. TransCore
3. Automatic Barriers Gates (AG): Magnetic Automation
4. Pedestal Mounting Arm (PMA): Housing Company

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.
2. Extruded Shapes: ASTM B 221.

B. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, commercial quality, with G60 coating designation; mill phosphatized.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

E. Anchorages: Anchor bolts; hot-dip galvanized according to ASTM A 153.

2.3 EQUIPMENT AND SUBSYSTEMS

A. Vendor shall provide newly manufactured equipment and associated materials for the Parking Access Control System.

B. All Parking Access Control System equipment performing a like function and of the same part number to be fully interchangeable without the requirement for physical modifications.

C. Provide device autonomy such that no single point of failure of a device causes an operational failure of surrounding devices.

D. Application and Data Servers:

1. Vendor shall propose an On-Premise (local servers) or a Cloud Based solution for the new Parking Access Control System.
2. For On-Premise solutions, provide Parking Access Control System Servers that meet manufacturer's requirements for the system specified herein.
3. Utilize TCP/IP for data communication.
4. Provide centralized management of the Parking Access Control System.
5. For On-Premise solutions, Parking Access Control System Servers to contain all Parking Access Control System application and database software that is associated with Parking Access Control System operation, data storage, and reports.
6. Install and configure all necessary software on the servers with all required system software licenses registered to the Owner.
7. For On-Premise solutions, the Parking Access Control System Servers may reside on the Owner's network. If the case, the Parking Access Control System Servers shall have secured access. The Owner's network administrator based upon a "need to know" decision shall establish an appropriate user-level password system. The Owner shall have complete ability to add to, delete from, or revise the user roles and passwords that are established by the network administrator.
8. Configure such that the following features and functionalities are attainable:
    a. Maintain 24 months of on-line data of all Parking Access Control System data. All on-line data shall be readily accessible without any delay in processing.
    b. Provide fault tolerance such that no server-level single point of failure causes disruption to the Parking Access Control System or corruption of Parking Access Control System data.
    c. Long Term Storage Media – Ability to archive all summary data for up to five years with

2.4 AUTOMATIC BARRIER GATES (AG)

A. General: Provide UL-approved Automatic Barrier Gate (AG) complete with a high speed and high performance barrier gate operator.

1. Components and Features: The AG shall have the following components, features and functionality:
    a. AG open/close time 1.4-1.9 seconds, based on boom length of 10 to 12 feet.
    b. Gate Arm options shall be the following:
        1) 10 - 12 foot aluminum arm.
        2) 10 - 12 foot articulating aluminum arm (for low ceiling heights).
    c. Direct drive operation resulting in condensation/corrosion resistance.
    d. Operation in cold climatic conditions and overall extended service life – no belts, pulleys or chains.
    e. Built-in position sensors (no limit switches) providing precise arm position status and a self-learning control unit to guarantee optimum braking and no boom arm bouncing, sagging or rotating out of position.
    f. Automatic reversing mechanism that stops gate arm movement if arm hits an object, and immediately reverses arm to the up position.
    g. Power outage shall allow raising manually the gate arm.
    h. Low power consumption and high MCBF (> 2,000,000 cycles).
    i. 100% duty cycle spring-balanced AC torque providing 2 million cycles;
    j. Build in PLC Controller with built-in dual channel vehicle loop detectors.
    k. Build in adjustable timer for arm gate closing.
    l. (5) – Potential free inputs.
    m. (2) - 24V DC outputs.
    n. Single, 115-V ac grounded power receptacle.
    o. Additional foam protection inserted on the bottom of octagonal aluminum boom for extra safety.
    p. Supports at least 4 loop detectors.
    q. Contact for release of barrier arm.
    r. Additional Input/Output (I/O) extension modules.

s. Boom arm lights with controller.
t. Network or serial connection module.
u. Heater for extremely cold environments.

2. Remote Control and Monitoring:
   a. Open arm command – momentary dry contact input.
   b. Close arm command – momentary dry contact input.
   c. Arm up output – continuously dry contact output or 24VDC output.
   d. Arm lost output – continuously dry contact output or 24VDC output.

B. Cabinets: Modular construction with drive unit mounted to a heavy duty casting allowing easy access door to be mounted on any side of AG. Provide single, gasketed access door for each cabinet with flush-mounted locks. Furnish two keys for each lock, all locks keyed alike. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet. Left or right-hand operation. Color – as specified by Owner.

2.5 VEHICLE DETECTORS AND DETECTOR LOOPS (DL)

A. Vehicle Loop Detector System: Provide self-tuning electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit signal activating gate- arm operator. Include automatic closing timer with adjustable time delay before closing, timer cut- off switch, and vehicle loop detector designed to open and close gate arm. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, as recommended in writing by detection system manufacturer for function indicated.

1. Detector Loop (DL): Preformed in size indicated for pave-over or wire for saw-cut installation, as recommended by Manufacturer.
2. System Performance: Capable of the following:
   a. Recognize two vehicles within 6 inches of each other on standard-sized loop.
   b. Recognize vehicle direction by detecting vehicle moving from one loop to another.
   c. Generate reverse count if vehicle backs up after generating directional count in forward direction.
   d. Continuous diagnostic monitoring for intermittently operating and failed loops.
   e. Crosstalk test between adjacent loops.

B. Prior to saw cutting DL's, Vendor is responsible for field verifying all existing reinforcement in concrete slabs and islands. Use of Ground Penetrating Radar (GPR) or other non-destructive means are acceptable. Do not damage existing rebar in concrete slabs and islands.

2.6 MOTION DETECTOR (MD)

A. General: a microwave activation solution for indoor and outdoor industrial applications. Falcon XL or approved equal.

B. Features:

1. Bidirectional, unidirectional approach and unidirectional depart microwave detection options
2. Six modes of detection filtering for pedestrian and parallel traffic rejection
3. Remote control programming enables user to quickly and safely make changes from the ground
4. Tilt angle from 0º – 180º
5. NEMA 4 rated enclosure
6. Temperature Range –22 ºF – 140 ºF

2.7 AUTOMATIC VEHICLE IDENTIFICATION READER (AVIR)

A. General: Provide and install AVIR, as indicated in these Functional Specifications.

B. Provide AVIR equipped with the following components, features and functionality:

1. Long Range Reader that reads and verifies Radio-Frequency Identification (RFID) credentials.
2. Minimum 18' read range.
3. Integrates with all other system devices, e.g. the garage's roll-down security gate.
4. Vends AG with valid read of AVI Tag.
5. System: Programmable with multiple-code capability that will grant or deny ingress/egress to the facility for individual tags.
6. Operation: On-line communication with FMS.
7. Features: Hard, Soft and Timed anti-passback options.
8. Capable of monitoring and auditing AG activity.
9. AVI Tags (Windshield Stickers): Provide 500.

C. Windshield Sticker Features: AVI windshield tag based on passive Ultra High Frequency (UHF) technology.

1. Identification up to 33 ft (10 meters)
2. Passive battery free tags
3. Thin, flexible sticker format
4. Protection against harmful UV rays
5. Optional tamper resistant
6. Customized printing
7. Security protected
8. EPC Gen 2 compatible

D. AVIR proposed shall be capable of being installed on a Pedestal Mounting Arm (PMA) gooseneck stand, on the cabinet of the Automatic Barrier Gate (AG) or from the underside of the parking garage structure as required, and weather resistant.

2.8 INTERCOM SYSTEM – INTERCOM STATION (IS) AND INTERCOM MASTER (IM)

A. General: Provide a Voice over Internet Protocol (VoIP) Intercom System for two-way communications between the parking equipment and the Parking Office.

B. Goose-neck stand for IS shall be powder-coated steel and 42 inches in height, or height recommended by Vendor and/or manufacturer. Weather resistant enclosure shall be made of marine grade 316 stainless steel and mounted to goose-neck stand as required. Size enclosure to accommodate IS.

C. PMA are required at the Entry and Exit Lanes on Caldwell Place and Elizabethtown Plaza and the judges nested area on the eighth level of the garage. Refer to parking equipment schedule by location table in Section 1.3.

1. Intercom System shall be equipped with the following components, features and functionality:
2. Fully digital, microprocessor based, modular design utilizing VoIP.
3. Programming server for all intercom features performed through networked workstation or from Intercom Master (IM).
4. Programmable configuration of Intercom Station (IS) and system features stored in non- volatile memory.
5. System includes all software and hardware required for programming system, including:
    a. Individually programmable volume control for each IS.
    b. IS shall be programmed to call IM.

c. Call forwarding feature for individual stations or all stations to re-direct calls to another designated location or designated phone number.

6. Intercom Master (IM) desktop model with noise cancelling microphone designed for high- noise environment. Required features:
   a. Provide full-duplex hands-free conversation with any other selected individual station or combination of stations in system.
   b. Integrated amplifier and loudspeaker.
   c. Firmware/feature upgrades available via download through intercom server with no local modification on station required.
   d. High sensitive microphone to provide clear conversation from a range of at least 5 ft. from field device.
   e. Minimum audio frequency range for audio components: 200-7000Hz.
   f. IS directory panel with direct access, pre-programmable function menus, selectable language, and adjustable display contrast.
   g. "Handset function" enabling user to switch from loud-speaking microphone operation to handset mode.
7. Parking Equipment field device IS requirements:
   a. IS to be integrated into faceplate of the PMA.
   b. Microphone, loudspeaker, and in-use LED all housed in one unit with configurable front pushbutton control.
   c. Digital Signal Processing (DSP) technology to provide full speaker/microphone supervision and fully adjustable (volume/timing threshold programmable via intercom server) audio monitoring.

2.9 FACILITY MANAGEMENT SOFTWARE (FMS)

A. Vendor shall provide a Parking Access Control System that includes a real-time Facility Management Software (FMS) system that operates on a computer from local server(s) or in the cloud and provides automatic on-line facility monitoring, supervision, and remote control of Parking Access Control System equipment and other related systems from one or more locations. FMS system shall be configured with, but not limited to, the following subsystems. Each subsystem shall be password protected to restrict access to individual functions of each subsystem to authorized users. All software shall have Graphical User Interface (i.e. Microsoft Windows).

1. The FMS shall have the ability to work in an On-Premise (server) or Cloud Based application based on Vendors proposed solution.
2. Vendors will include three (3) licenses for the system software for use on owner workstations. The owner will supply workstations.
3. The FMS shall support web access at least, but not limited to the following modules:
   a. Remote control of open/close gates, and hold gate up, etc.
   b. Permit/Monthly card holder management. Provide Owner and/or Operator login credentials to manage card holder accounts by departments, group, company, etc.
4. FMS Clients can be added to the Parking Access Control System to support real- time monitoring & control from multiple locations.
5. The Parking Access Control System shall be able to support an unlimited number of FMS clients regardless of their location on the network.
6. The FMS shall have the capability to control multiple parking lots from the same workstation.

B. System Monitoring – Device Status: The FMS shall be capable of monitoring in real-time the status of the various lane devices and the corresponding subcomponents and shall have the following capabilities:

1. Monitor and control the operational status of all entry lanes:
   a. Lane status – open or closed
   b. Device status: active or out of service.

c. Door status: open or closed.
d. Gate up.
e. Illegal exit - reverse direction through lane.
f. Back-out.

2. Monitor the operational status of all exit lanes:
   a. Lane status – open or closed.
   b. Device status – active or out of service.
   c. Door status – open or closed.
   d. Gate failure.
   e. Gate up.
   f. Illegal exit – reverse direction through lane.
   g. Back-out.

C. Transaction Counts: Each time a vehicle pass event occurs, the FMS shall increment or decrement a count, in order for the FMS to provide the following data:

1. For Entries:
   a. Total counts.
   b. AVI tag entries.
   c. Access credentials read in the entry lanes.
2. For Exits:
   a. Total transactions processed and subtotals.
   b. AVI tag entries.
   c. Access credentials read in the entry lanes.
3. All transaction's, and access credentials read in the entry and exit lanes. All transaction counts shall appear in lane activity reports.
4. The system shall provide a tool to assist the Owner or Operator with remote vending of AG's. The purpose of the tool is to insure that all remote AG vends are tied properly to the counting system. .

D. System Alerts: The FMS shall have the following system alert capabilities:

1. The alarms function shall allow the user to select which events to alarm.
   a. Alerts can be displayed on a workstation or sent to an authorized user via email notification.
   b. Abnormal status conditions shall be flashed on monitor(s) and accompanied with an audible alarm.
   c. Display shall continue to flash until abnormal condition is corrected. Audible alarm shall continue until it is turned off by a command issued from a Parking Access Control System monitoring workstation(s).
   d. Acknowledgement of alarm condition shall be able to be performed at any workstation with access to FMS.
   e. It shall not be necessary to acknowledge alarm condition at every workstation.
   f. The FMS shall record abnormal status condition of alarm condition by time.
   g. Authorized users shall see and be able to manage alarms.
   h. Alarms shall be selectable as visual, email or both.

E. Event Logs: The FMS shall have the following event log capabilities:

1. Record all system events, which can be viewed or printed.
   a. Record the specific information and details for changes to system configurations including type of change, date/time, and user ID.
   b. Have the ability to sort events by activity type and/or device ID.

F. User Access: The FMS shall provide individual access right to users.

1. Each user shall be able to access the FMS with their individual password.

2. Users shall be able to access only the modules and options that have been set by software administrator.

G. Manual Management: The Parking Access Control System shall provide the following remote management functionality:

1. Allows the following exception transactions occurring at entries and exits to be processed at a Parking Access Control System workstation and records each exception type uniquely.
   a. Unreadable entry media.
   b. Unreadable AVI Tag.

H. Access Control: The FMS shall include a fully integrated Access Module to manage monthly/permit parking. The FMS shall provide the following AVI tag management functionality:

1. Ability to securely activate and personalize the AVI tag.
2. Provide unlimited cardholder accounts per facility.
3. Allow authorized users to create accounts and activate/deactivate AVI tags.
4. Account settings to be changed for a specific AVI tag.
5. Retain account activity history should an AVI tag be deactivated and reissued to another user.
6. Ability to distinguish between different parking zones/areas/lots and apply restrictions accordingly.
7. Ability to have a master account and subaccounts.
8. AVI tag restrictions by facility, master account, subaccounts, and individual for time of day and day of week.
9. Assign anti-pass back settings to all accounts and individuals.
10. Ability to reset AVI tag status for individual access by group and by facility.
11. Ability to check AVI tag validity at time of entry.
12. Record all usage including lane number, entry and exit date/time, AVI tag number and pass-back status.
13. Ability to troubleshoot unreadable AVI tag for quick lookup of status, activity, payment history, anti-pass back status, etc.
14. Capable of setting different access privileges for an entire group or for an individual AVI tag holder.
15. The FMS shall provide the following data input fields for each AVI tag.
    a. A unique AVI tag number.
    b. Customer ID number.
    c. Account number.
    d. AVI tag holder name.
    e. AVI tag expiration period.
    f. AVI tag holder organization.
    g. AVI tag holder department.
    h. AVI tag holder telephone number.
    i. AVI tag holder email address.
    j. Parking privilege code access profiles.
    k. Customer’s vehicle license plate number.
    l. Customer’s driver’s license number.
    m. Customer’s vehicle make and model.

I. Daily AVI Tag Management: The FMS shall provide the following AVI tag management functionality.

1. New AVI tag holder - Ability to record AVI tag holder details including AVI tag number, expiration date and group or subgroup associations.
2. Renew AVI tag – Ability to change the expiration date for an existing AVI tag or one that has been temporarily blocked to allow access to a facility again.
3. Block AVI tag – Ability to change the status of a blocked AVI tag without changing its associated details.

4. Unlock an AVI tag – Change the status of a blocked AVI tag to normal without changing its associated details.
5. Cancel AVI tag – Ability to cancel an AVI tag in the FMS but not its history.

J. AVI Tag Restrictions: The FMS shall provide the following AVI tag management functionality.

1. Ability to set hard, soft or no Anti-Pass Back restrictions to individual access cards/tag.
2. Ability to arm readers to prevent a pedestrian from presenting an AVI tag without a vehicle present.
3. Provide access restrictions preventing an AVI tag holder from passing through certain lanes.
4. Ability to prevent an AVI tag holder from entering a specific zone/area/lot when the available parking spaces assigned to a particular AVI tag group has been occupied.

K. Provide all software and software licensing required by the system.

L. Utilize proven, off-the-shelf software (i.e., software already manufactured and available for delivery) to the greatest extent possible.

M. Unless specified elsewhere, provide the latest available software version at the time of system implementation for all third party software.

N. Make any necessary modifications, and provide documentation of such modifications, to existing third party software programs that the Vendor adopts for the system. Should the Vendor and the software manufacturer be separate entities, the software modifications will not preclude the purchase of a standard maintenance and service contract from the manufacturer.

O. Purchase software maintenance for all third party software naming the Owner as the software Owner and contact. Provide maintenance agreements throughout the duration of the warranty period.

P. Provide any necessary perpetual licenses and/or authorization for all Parking Access Control System related software including, but not limited to, operating systems, application software, development language, peripheral software, and Parking Access Control System hardware diagnostic software. If available, provide a site license to the Owner, meaning usage of the license is unrestricted, regardless of the physical locations where the software may be used.

Q. Provide licenses that cover future updates as required by these specifications.

R. Deliver all software documentation to the Owner prior to commencing system testing.

S. Database Management System:

1. Provide application software consisting of software to provide complete operation of the Parking Access Control System including the database management system.
2. Maintain data recorded by the Parking Access Control System in files that are in ODBC compatible formats.

T. Operating System Platform:

1. Operating system software shall consist of software to support system setup, system operation, routine hard drive backups, diagnostics, and other maintenance routines.
2. Upgrade the Parking Access Control System application to operate on the most current operating system upon commercial release of a new operating system version. Upon completion of successful
3. Vendor testing, recommend implementation of the patch. Implementation is subject to Owner’s approval.

U. Parking Access Control System Application Software:

1. Install and configure all application software and firmware required by the Parking Access Control System with all software licenses registered to the Owner.
2. Shall provide complete operation of the Parking Access Control System and includes the database management system.
3. Allows for future upgrade and expansion of the Parking Access Control System.
4. Browser-based and web-browser enabled such that the Parking Access Control System is accessible from any authorized Owner workstation connected to their network.
5. Operates across Owner's Local Area Network (LAN), accessible with proper user ID and password, on all workstations authorized to access the Parking Access Control System software modules.
6. Allow multiple groups and roles that govern individual access to the system. The assignment of a group/role will control access to the various modules of the Parking Access Control System, and if the access is update or view only.
7. Access rights to the system for the various groups and roles will be defined during implementation and at a minimum shall provide the following features and functionality
8. Parking Access Control System application software shall provide, at a minimum, the following:
    a. Manage, display, and report all Parking Access Control System-related activity as outlined in this Functional Specification.
    b. GUI that is intuitive and user friendly.
    c. Automatic detection and reporting of fault conditions and equipment failures.
    d. Categorize fault condition by severity and display alarm notification on the system GUI as well as notify designated Operator/Owner personnel via email and/or text message for any individual fault condition, category of fault, or Owner-selected group of faults.
    e. Reporting as outlined in the Reporting section.
    f. Facility monitoring of all Parking Access Control System field devices
    g. Central access and control of field devices for users with the appropriate authorization to issue remote commands from system workstations to the field devices, such as raising and lowering a AG; rebooting field devices; putting field devices in or out of service; etc.
    h. Audit trail for the use of central controls within the Parking Access Control System database by user ID, time, device controlled and action taken.
    i. Remote communication with all devices in real-time for a general broadcast of information or software update and an ability to communicate to a single device to upload information or software. It shall be possible to remotely shutdown a field device's operating system, upload updates and remotely restart the field device.
    j. Ability to export all query results and reports to multiple formats including Portable Document Format (PDF), comma-separated-value, Microsoft Excel©, Microsoft Access©, etc.

2.10 REPORTING

A. General Functionality: The FMS shall include a fully integrated Report Module providing the following features and capabilities.

B. The FMS shall maintain data without limitation from system start-day for use by the Report Module.

1. Reports can be scheduled to run and emailed to specified users.
2. Reports can be scheduled to run automatically. For example, on the first day of each quarter, weekly, etc.
3. The Reports Module provides real-time reporting.
4. Reports (manual and automated) can be run at any time and not impact the system performance.
5. Reports can be exported to Microsoft Word, Excel, PDF etc.
6. The Reports Module shall be able to provide ad hoc reporting such as Crystal Reports Software.

7. The database of the FMS shall contain sufficient 'Views' to support external reporting tools such as Crystal Reports.
8. Queries can minimally be run for transactions by day/date/time (or time range), device, user ID, payment type, amount or amount range, AVI tag number or by exception type.
9. Query results are sortable.

C. System Reports: The Reports Module shall be able to generate the following System Events Reports, which provide event log data about AG openings, device counters and device alerts:

1. *Open Gates Report:* Is a list of AG openings, sorted by lane device, during a specific time period.
2. *Gate Activity Report:* Lists AG opening counts broken down by transaction type during a specific time period.
3. *System Alerts Report:* Lists the operation and maintenance alerts, broken down by device during a specified time period.
4. *Non-Resettable Counts Report:* Maintains activity counts for each entry and exit lane during a specified time period.

D. Occupancy and Traffic Reports: The Reports Module shall be able to generate the following Occupancy and Traffic Reports that provide statistical traffic and occupancy data including parking time counts, overflow area analysis, and in addition to demand level assessments by customer type:

1. *Permit/Monthly Occupancy Report:* Displays chronologically, permit/monthly customer occupancy statistics during a specific hour during the day.
2. *Permit/Monthly Parking Time Report:* Displays chronologically, parking time statistics of permit/monthly customers, based on the amount of hours of parking time.
3. *Daily Traffic Report:* Lists card holder entry/exit traffic transactions, grouped by calendar date during a specific time period.
4. *Detailed Overflow Report:* Is a detailed listing of permit/monthly card holder overflow transactions that occurred during a specific time period.
5. *Permit/Monthly Overflow Detailed Report:* Is a detailed listing of permit/monthly card holder overflow transactions that occurred during a specific time period.
6. *Permit/Monthly Occupancy Report:* Lists chronologically, permit/monthly hourly occupancy statistics over a specific time period.
7. *Permit/Monthly Parking Time Report:* Lists hourly permit/monthly counts, broken down by users during a selected time period.

E. Monthly Reports: The Reports Module shall be able to generate the following Permit/Monthly Reports that provide data about monthly customers and the way in which they use the parking facility:

1. *Permit/Monthly Detailed Report:* Is a summarized list of permit/monthly customer traffic statistics, broken down by users during a specific time period.
2. *Permit/Monthly Units Report:* Is a list of permit/monthly customer usage statistics based on their entry transactions and broke down by users for a specific month.
3. *Permit/Monthly List Report*: Is a list of current permit/monthly customers, sorted by access profile. The report also includes the cardholder's assigned usage privileges and price rate details.
4. *Detailed Monthly Traffic Report:* Is a chronological listing of permit/monthly customer traffic transactions, sorted by users over a specific period of time.
5. *Monthly Exceeding Report:* Is a list of permit/monthly customers who have exceeded their allotted garage usage allowance during a specified time period. The report includes overstay statistics, plus the imposed overstay charges.
6. *Detailed Permit/Monthly Traffic Location Report:* Lists permit/monthly customer entry and exit traffic transactions, sorted by calendar date over a specific time period.
7. *Permit/Monthly Traffic Track Report:* Is a chronological list of permit/monthly customer entry and exit transactions over a selected period of time.

8. *Permit/Monthly List with No Activity Report:* Lists permit/monthly customers with no garage usage activity during a defined period of time. The report is grouped by users and includes each customer's usage and pricing profile.

F. Analytical Reports: The Reports Module shall provide the following statistical charts:

1. *Entry & Exit Flow Chart:* Shows the number of vehicles entering and exiting the parking garage during the day. This statistic chart shall provide information between two dates chosen by the Owner or Operator.
2. *Occupancy Distribution Chart:* Displays vehicle occupancy by hours during the day. This statistical chart shall provide information between two dates chosen by the Owner or Operator.

2.11 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum Finishes: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: thermosetting, modified-acrylic enamel primer/topcoat system). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

C. Galvanized Steel Finishes: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

1. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking.

2.12 SPARE PARTS

A. Vendor shall include in their Proposal a list and cost of any Spare Parts that are recommended to be stored onsite for emergency service support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Vendor shall examine substrates, areas, and conditions for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.

1. Vendor shall submit a written report listing all conditions that will be detrimental to the performance of the installed system.

B. Examine rough-in for electrical systems to verify actual locations of connections before parking control equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Prior to mounting equipment indicated herein with anchor bolts or expansion anchors and saw cutting DL's, Vendor is responsible for field verifying all existing reinforcement in concrete slabs and islands. Use of Ground Penetrating Radar (GPR) or other non-destructive means are acceptable. Do not damage existing rebar in concrete slabs and islands.

B. Automatic Barrier Gates (AG): Anchor cabinets to concrete bases with anchor bolts or expansion anchors and mount barrier-gate arms.

C. Detector Loops (DL): Bury and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to Vehicle detector located in the parking control equipment lane devices.

D. Intercom Stations (IS) and Pedestal Mounting Arm (PMA): Anchor cabinets to concrete bases with anchor bolts or expansion anchors. AVIR shall be mounted from underside of garage structure above or post mounted in the lane, as recommended by the Vendor.

1. Connect equipment to remote computer.

E. Intercom System: Install all software and hardware in Parking Office as required by manufacturer requirements.

F. Facility Management Software (FMS): Install all servers, software and other miscellaneous communication/hardware/devices as required to provide a fully operational and functional parking equipment system as defined in this specification.

G. Ground equipment as recommended by the manufacturer and Contractor.

H. Connect Low-Voltage and Electrical Power Conductors and Cables as required per local codes and specifications. The bidder will be responsible for providing and pulling the fiber / low voltage wiring within the conduit provided.

I. The bollards and islands are to be installed by the General Contractor.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Each electrical test and visual and mechanical inspection shall be stated in NETA ATS, Section 7.15 and compliance with test parameters shall be certified.
2. Operational Test: After electrical circuitry has been energized, units shall be started to confirm proper motor rotation and unit operation.
3. Controls and safeties shall be tested and adjusted. Report any damaged and malfunctioning controls and equipment.

C. Remove and replace parking control equipment where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Vendor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

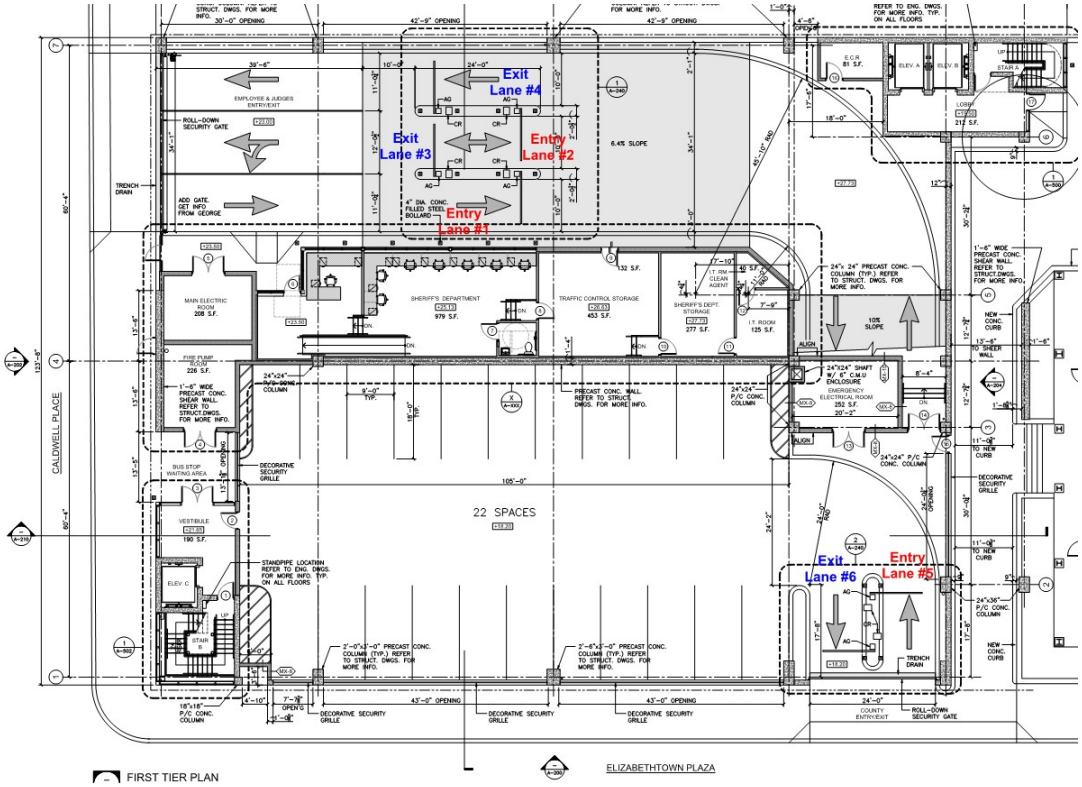
3.4 ADJUSTING AND CLEANING

A. Adjust parking control equipment to operate smoothly, easily, and properly. Confirm that locks engage accurately and securely without forcing or binding.

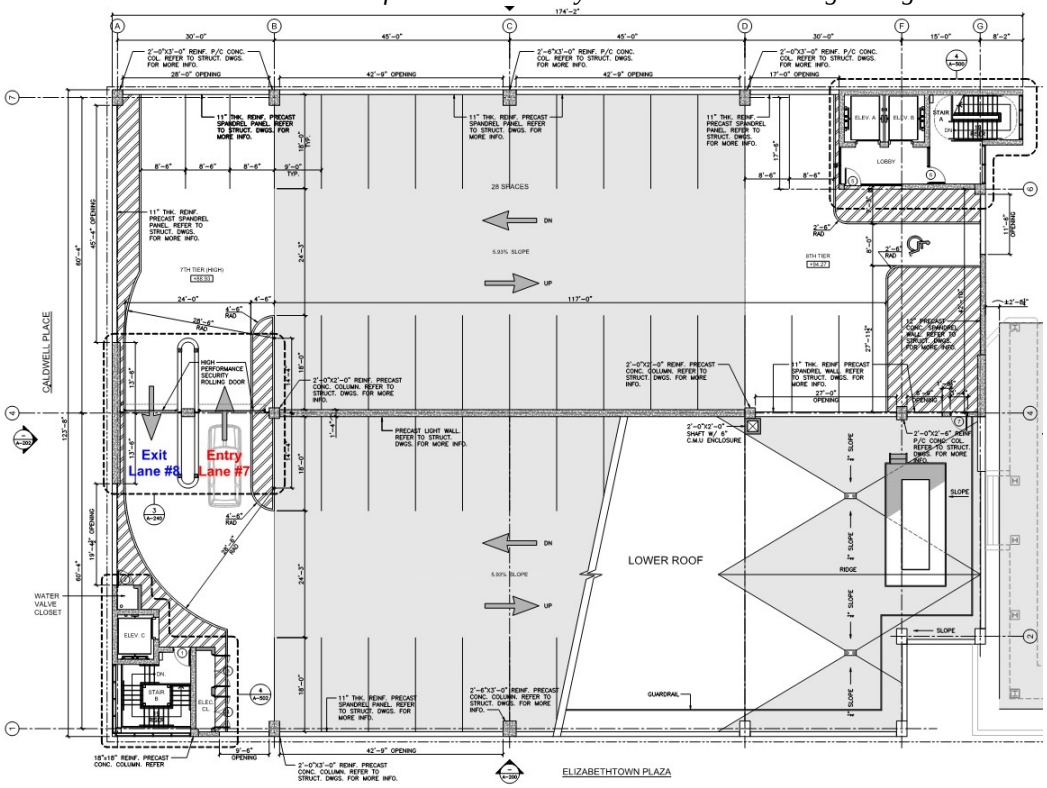
B. Lubricate hardware, gate operators, and other moving parts.

C. After completing installation of exposed, factory-finished parking control equipment, inspect exposed finishes and repair damaged finishes.

END OF SECTION



First Tier Architectural Plan of the Union County Elizabethtown Parking Garage



Eighth Tier Architectural Plan of the Union County Elizabethtown Parking Garage

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark interior face of material if applicable.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop

Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS (W1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product per Finish Schedule or equal product by one of the following or equal:

1. DFB Sales Inc.
2. Hunter Douglas Contract.
3. MechoShade Systems, Inc.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Nickel-plated metal.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Shadeband Material: Light-filtering and light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Per manufacturer’s product designation; refer to Finish Schedule.
3. Weave: Mesh.
4. Openness Factor: 1 percent.
5. Color: Refer to Finish Schedule.

C. Light-Blocking Fabric (Dorm and Capitan Quarters): Opaque fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Fiberglass textile with acrylic backing.

Coordinate requirements retained in "Orientation on Shadeband" Subparagraph below with requirements in "Roller Shade Fabrication" Article. See "Shadebands" Article in the Evaluations for a discussion of up-the-bolt and railroaded fabrics.

3. Orientation on Shadeband: Up the bolt.

Outside face of light-blocking fabrics are often white.

4. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Roller Shade Locations: At exterior windows.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123623 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops and supporting bases.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For plastic-laminate-clad countertops and bases.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.

C. Samples for Initial Selection: For plastic laminates.

1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.5 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturers / Products: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or equal product.

2.2 PLASTIC-LAMINATE-CLAD COUNTERTOPS (PL1, PL2)

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from certification program indicating that countertops comply with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by manufacturer's designations.
2. Match Architect's sample.
3. As selected by Architect from manufacturer's full range in the following categories:
   a. Solid colors and finish.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: MDF.

G. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Softwood Plywood: DOC PS 1.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement as selected by fabricator to comply with requirements.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times countertop fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical-treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
2. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces.

C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123623

SECTION 142100 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electric traction passenger elevators.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
3. Division 04 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
4. Division 05 Section "Metal Fabrications" for the following:
    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Divider beams.
    c. Hoist beams.
    d. Structural-steel shapes for subsills.
    e. Pit ladders.
    f. Cants made from steel sheet in hoistways.
5. Division 05 Section "Pipe and Tube Railings" for railings between adjacent elevator pits.
6. Division 09 Section "Resilient Sheet Flooring" for finish flooring in elevator cars.
7. Division 22 for sump pumps.
8. Division 28 for smoke detectors in elevator lobbies to initiate emergency recall operation and for connection to elevator controllers.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44.

B. Continuing Maintenance Proposal:

1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Schindler Elevator Corp; "3300 XL" Gearless Traction Elevator or comparable product by one of the following or equal:

1. Otis Worldwide Corporation.
2. ThyssenKrupp Elevator.
3. Schindler Elevator Corp.

B. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."

2. Project Seismic Design Category: C.
3. Elevator Component Importance Factor: 1.0.
4. Design earthquake spectral response acceleration short period (Sds) for Project is 0.2s.
5. Provide earthquake equipment required by ASME A17.1/CSA B44.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Elevator Number(s): 1, 2,3 .
2. Machine Type: Gearless traction.
3. Rated Load: 3500 lb.
4. Rated Speed: 200 fpm.
5. Operation System: Selective-collective automatic operation (single car) and group automatic operation.
6. Auxiliary Operations: Battery-powered automatic evacuation.
7. Security Features: Keyswitch operation.
8. Car Enclosures:
    a. Inside Width: Not less than 76 inches from side wall to side wall.
    b. Inside Depth: Not less than 66 inches from back wall to front wall (return panels).
    c. Inside Height: Not less than 93 inches to underside of ceiling.
    d. Front Walls (Return Panels): Satin stainless steel, ASTM A480, No. 4 finish.
    e. Car Fixtures: Satin stainless steel, ASTM A480, No. 4 finish.
    f. Side and Rear Wall Panels: Satin stainless steel, ASTMA 480, No. 4 finish.
    g. Reveals: Black.
    h. Door Faces (Interior): Satin stainless steel, ASTM A480, No. 4 finish.
    i. Door Sills: Aluminum.
    j. Ceiling: Satin stainless steel, ASTM A480, No. 4 finish.
    k. Handrails: 1/2 by 2 inches rectangular anodized aluminum.
    l. Floor prepared to receive resilient flooring (specified in Division 09 Section "Resilient Sheet Flooring").
9. Hoistway Entrances:
    a. Width: 36 inches.
    b. Height: 84 inches.
    c. Type: Two-speed side sliding.
    d. Frames and Doors: Satin stainless steel, ASTM A480, No. 4 finish.
10. Hall Fixtures: Satin stainless steel, ASTM A480, No. 4 finish.
11. Additional Requirements:
    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480, No. 4 finish.
    b. Elevator #3: Priority service at all floors at elevator dedicated for Judge’s use.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

B. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

C. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Division 05 Section "Metal Fabrications" for materials and fabrication.

D. Car Frame and Platform: Bolted- or welded-steel units.

E. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Group Automatic Operation with Demand-Based Dispatching: Provide group automatic system that assigns cars to hall calls based on a dispatching program designed to minimize passenger wait time. System automatically adjusts to demand changes for different traffic conditions including heavy incoming, heavy two-way, heavy outgoing, and light off-hours as variations of normal two-way traffic.

C. Auxiliary Operations:

1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Group Battery-Powered Automatic Evacuation: If power fails, cars that are at a floor remain at that floor, open their doors, and shut down. Cars that are between floors are moved one at a time to the next floor above or below, open their doors, and shut down. System includes rechargeable battery and automatic recharging system.

D. Security features shall not affect emergency firefighters' service.

1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations and hall push-button stations. Key is removable only in deactivated position.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES

A. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.
2. Floor Finish: Specified in Division 09 Section "Resilient Sheet Flooring."

3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
9. Metal Ceiling: Flush panels, with four low-voltage downlights in each panel.
10. Light Fixture Efficiency: Not less than 35 lumens/W.
11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Stainless Steel Frames: Formed from stainless steel sheet.
2. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
3. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
4. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.

1. Mark buttons and switches for function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Sections.

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group.

1. Equip units with buttons for calling elevator and for indicating desired direction of travel.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A1011, commercial steel, Type B, pickled.

C. Stainless Steel Sheet: ASTM A240, Type 304.

D. Textured Stainless Steel Sheet: ASTM A240, Type 304 with embossed texture rolled into exposed surface.

E. Stainless Steel Bars: ASTM A276, Type 304.

F. Stainless Steel Tubing: ASTM A554, Grade MT 304.

G. Aluminum Extrusions: ASTM B221, Alloy 6063.

H. Nickel Silver Extrusions: ASTM B151, Alloy UNS No. C74500 or UNS No. C77600.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include three months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s).

B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

END OF SECTION 142100

SECTION 210513 COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 210513

SECTION 210517 SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.
4. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Or approved equal

B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.

D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

E. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. GPT; an EnPro Industries company.
3. Metraflex Company (The).
4. Or approved equal

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Carbon steel.
5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout or silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Steel pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Steel pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 210517

SECTION 210518 ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. ProFlo; a Ferguson Enterprises, Inc. brand.
4. Or approved equal

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Steel with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece cast brass with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: Split floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 210518

SECTION 210523 GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Iron butterfly valves with indicators.
2. Check valves.
3. Iron OS&Y gate valves.
4. NRS gate valves.
5. Indicator posts.
6. Trim and drain valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of valve from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Fire Main Equipment: HAMV - Main Level.

    a. Indicator Posts, Gate Valve: HCBZ - Level 1.
    b. Ball Valves, System Control: HLUG - Level 3.
    c. Butterfly Valves: HLXS - Level 3.
    d. Check Valves: HMER - Level 3.
    e. Gate Valves: HMRZ - Level 3.

2. Sprinkler System & Water Spray System Devices: VDGT - Main Level.

    a. Valves, Trim and Drain: VQGU - Level 1.

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

    a. Indicator posts.
    b. Valves.

        1) Gate valves.
        2) Check valves
        3) Miscellaneous valves.

C. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B31.9 for building services piping valves.

D. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

E. NFPA Compliance for valves:

1. Comply with NFPA 13, NFPA 14, NFPA 20, and NFPA 24.

F. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher, as required by system pressures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

2.3 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Kennedy Valve Company; a division of McWane, Inc.
3. Tyco by Johnson Controls Company.
4. Victaulic Company.
5. Or approved equal

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.

4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron, and EPDM or SBR coated.
7. Actuator: Worm gear.
8. Supervisory Switch: Internal or external.
9. Body Design: Grooved-end connections.

2.4 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ames Fire & Waterworks; A WATTS Brand.
2. FEBCO; A WATTS Brand.
3. Globe Fire Sprinkler Corporation.
4. Kennedy Valve Company; a division of McWane, Inc.
5. Or approved equal

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel with elastomeric seal.
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.5 IRON OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kennedy Valve Company; a division of McWane, Inc.
2. Mueller Co.
3. Victaulic Company.
4. WATTS.
5. Zurn Industries, LLC.
6. Or approved equal

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.

4. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

2.6 NRS GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mueller Co.
2. NIBCO INC.
3. Victaulic Company.
4. Zurn Industries, LLC.
5. Or approved equal

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

2.7 INDICATOR POSTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Kennedy Valve Company; a division of McWane, Inc.
4. Mueller Co.
5. Or approved equal

B. Description:

1. Standard: UL 789 and FM Global standard for indicator posts.
2. Type: Underground Upright.
3. Base Barrel Material: Cast or ductile iron.
4. Extension Barrel: Cast or ductile iron.

5. Cap: Cast or ductile iron.
6. Operation: Wrench.

2.8 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. Tyco by Johnson Controls Company.
    c. Victaulic Company.
    d. WATTS.
    e. Or approved equal

2. Description:

    a. Pressure Rating: 175 psig.
    b. Body Design: Two piece.
    c. Body Material: Forged brass or bronze.
    d. Port size: Full or standard.
    e. Seats: PTFE.
    f. Stem: Bronze or stainless steel.
    g. Ball: Chrome-plated brass.
    h. Actuator: Handlever.
    i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
    j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fire Protection Products, Inc.
    b. NIBCO INC.
    c. United Brass Works, Inc.
    d. Or approved equal

2. Description:

    a. Pressure Rating: 175 psig.
    b. Body Material: Brass or bronze.
    c. Ends: Threaded.
    d. Stem: Bronze.
    e. Disc: Bronze.
    f. Packing: Asbestos free.
    g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. NIBCO INC.
   b. United Brass Works, Inc.
   c. Or approved equal

2. Description:

   a. Pressure Rating: 175 psig.
   b. Body Material: Bronze with integral seat and screw-in bonnet.
   c. Ends: Threaded.
   d. Stem: Bronze.
   e. Disc Holder and Nut: Bronze.
   f. Disc Seat: Nitrile.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with requirements in the following Sections for specific valve-installation requirements and applications:

1. Section 211100 "Facility Fire-Suppression Water-Service Piping" for application of valves in fire-suppression water-service piping.
2. Section 211200 "Fire-Suppression Standpipes" for application of valves in fire-suppression standpipes.
3. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.
4. Section 211316 "Dry-Pipe Sprinkler Systems" for application of valves in dry-pipe, fire-suppression sprinkler systems.
5. Section 211339 "Foam-Water Systems" for application of valves in AFFF piping.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply, except from fire-department connections. Install permanent identification signs, indicating portion of system controlled by each valve.

C. Install double-check valve assembly in each fire-protection water-supply connection.

D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the pipe center.

F. Install valves in position to allow full stem movement.

G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

END OF SECTION 210523

SECTION 210529 HANGERS & SUPPORTS FOR FIRE-SUPPRESSION PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 210516 "Expansion Fittings and Loops for Fire-Suppression Piping" for pipe guides and anchors.
3. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for vibration isolation devices and seismic restraints.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for fire-suppression piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

C. NFPA Compliance: Comply with NFPA 13.

D. UL Compliance: Comply with UL 203.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube Hangers:

1. Description: Copper-coated-steel, factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. National Pipe Hanger Corporation.
3. nVent (CADDY).
4. Pipe Shields Inc.
5. Or approved equal

B. Insulation-Insert Material: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psi ASTM C552, Type II cellular glass with 100-psi or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: NFPA-approved, UL-listed, or FM-approved threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. MKT Fastening, LLC.
d. Simpson Strong-Tie Co., Inc.
e. Or approved equal

B. Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton (B-line).
b. Empire Tool and Manufacturing Co., Inc.
c. Hilti, Inc.
d. Or approved equal

2. Indoor Applications: Zinc-coated or Stainless steel.
3. Outdoor Applications: Stainless steel.

2.6 EQUIPMENT SUPPORTS

A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.7 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout, suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Install in accordance with approvals and listings.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Install in accordance with approvals and listings.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099113 "Exterior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use thermal hanger-shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
7. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Comply with NFPA requirements.

L. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. C-Clamps (MSS Type 23): For structural shapes.
3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

M. Saddles and Shields: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

N. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 210529

SECTION 210548 VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restraints - rigid type.
5. Restraints - cable type.
6. Restraint accessories.
7. Post-installed concrete anchors.

B. Related Requirements:

1. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
2. Section 230548 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal:

1. For each seismic-restraint device, including seismic-restrained mounting, pipe-riser resilient support, snubber, seismic restraint, seismic-restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:
    a. Seismic-Restraint Selection: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
    b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building

structure, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.

c. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.

d. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.

e. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" in "Performance Requirements" Article.

f. Qualified Professional Engineer: All designated-design submittals for seismiccalculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Seismic-Restraint Detail Drawing:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

c. Coordinate seismic restraint details with wind-load restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.

3. Product Listing, Preapproval, and Evaluation Documentation: By an evaluation service member of ICC-ES, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

4. All delegated-design submittals for seismic-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.

D. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Welding certificates.

C. Field quality-control reports.

D. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in ASCE/SEI 7-05, Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.

1. Provide equipment manufacturer's written certification for each designated active fire-suppression system seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7 and AHRI 1270, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction or experience data as permitted by ASCE/SEI 7-05.
2. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05.
3. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by a licensed professional engineer.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic control system.

1. Seismic Performance: Equipment must be designed and secured to withstand the effects of earthquake motions determined in accordance with NFPA 13 and ASCE/SEI 7-05.
2. Wind-Load Performance: Equipment must be designed and secured to withstand the effects of high wind events determined in accordance with ASCE/SEI 7-05.

B. Seismic Design Calculations:
1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods

acceptable to applicable code authorities and as presented in NFPA 13 and ASCE/SEI 7-05. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.

a. Data indicated below to be determined by Delegated-Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.

b. Coordinate seismic design calculations with wind-load calculations for equipment mounted outdoors. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.

c. Building Risk Category: II.

d. Building Site Classification: D.

2. **C**alculation Factors, ASCE/SEI 7-16, Ch. 13 - Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-16 unless otherwise noted.

a. Horizontal Seismic Design Force F_p: Value is to be calculated by Delegated-Design Contractor using Equation 13.3-1. Factors below must be obtained for this calculation.

1) S_{DS} = Spectral Acceleration: 0.195. Value applies to all components on Project.
2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
3) I_p = Component Importance Factor: See Drawing Schedule for each component.
4) W_p = Component Operating Weight: For each component. Obtain by Delegated-Design Contractor from each component submittal.
5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
6) z = Height in Structure of Point of Attachment of Component for Base: Determine from Project Drawings for each component by Delegated-Design Contractor. For items at or below the base, "z" shall be taken as zero.
7) h = Average Roof Height of Structure for Base: Determine from Project Drawings by Delegated-Design Contractor.

b. Vertical Seismic Design Force: Calculated by Delegated-Design Contractor using method explained in ASCE/SEI 7-16, Paragraph 13.3.1.2.

c. Seismic Relative Displacement D_{pl}: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.2. Factors below must be obtained for this calculation:

1) D_p = Relative Seismic Displacement that Each Component Must Be Designed to Accommodate: Calculated by Delegated-Design Contractor in accordance with ASCE/SEI 7-16, Paragraph 13.3.2.
2) I_e = Structure Importance Factor: 1. Value applies to all components on Project.

3) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
4) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
5) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
6) h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
7) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
8) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedules for each component.
9) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedules for each component.
10) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a: See Drawings Schedules for each component.

d. Component Fundamental Period T_p: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.3. Factors below must be obtained for this calculation:

1) W_p = Component Operating Weight: Determined by contractor from Project Drawings and manufacturer's data.
2) g = Gravitational Acceleration: 32.17 fps2.
3) K_p = Combined Stiffness of Component, Supports, and Attachments: Determined by delegated-design seismic engineer..

3. Calculation Factors, ASCE/SEI 7-10, Ch. 13 - Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-10 unless otherwise noted.

a. Horizontal Seismic Design Force F_p: Calculated by Delegated-Design Contractor by ASCE/SEI 7-10, Equation 13.3-1. Factors below must be obtained for this calculation.

1) S_{DS} = Spectral Acceleration: 0.195. Value applies to all components on Project.
2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
3) I_p = Component Importance Factor: See Drawing Schedule for each component.
4) W_p = Component Operating Weight: For each component. Obtain by Delegated-Design Contractor from equipment submittal.
5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
6) z = Height in Structure of Point of Attachment of Component for Base: Determined from Project Drawings for each component by Contractor. For items at or below the base, "z" shall be taken as zero.

7) h = Average Roof Height of Structure for Base: Determine from Project Drawings by Delegated-Design Contractor.

b. Vertical Seismic Design Force: Calculate by Delegated-Design Contractor using method explained in ASCE/SEI 7-10, Paragraph 13.3.1.

c. Seismic Relative Displacement D_{pl}: Calculate by Delegated-Design Contractor using methods explained in ASCE/SEI 7-10, Paragraph 13.3.2. Factors below must be obtained for this calculation:

1) D_p = Relative Seismic Displacement that Each Component Must Be Designed to Accommodate: Calculate by Delegated-Design Contractor in accordance with ASCE/SEI 7-10, Paragraph 13.3.2.
2) I_e = Structure Importance Factor: 1. Value applies to all components on Project.
3) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
4) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
5) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
6) h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
7) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
8) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedule for each component.
9) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedule for each component.
10) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a: See Drawing Schedule for each component.

4. Calculation Factors, ASCE/SEI 7-05, Ch. 13 - Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-05 unless otherwise noted.

a. Horizontal Seismic Design Force F_p: Calculated by Delegated-Design Contractor by ASCE/SEI 7-05, Equation 13.3-1. Factors below must be obtained for this calculation:

1) S_{DS} = Spectral Acceleration: 0.195. Value applies to all components on Project.
2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
3) I_p = Component Importance Factor: See Drawing Schedule for each component.
4) W_p = Component Operating Weight: Obtain by Delegated-Design Contractor for each component from component submittal.

5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
6) z = Height in Structure of Point of Attachment of Component for Base: Determine by Delegated-Design Contractor for each component from Project Drawings. For items at or below the base, "z" shall be taken as zero.
7) h = Average Roof Height of Structure for Base: Determine by Delegated-Design Contractor from Project Drawings.

b. Vertical Seismic Design Force: Calculated by Delegated-Design Contractor using method explained in ASCE/SEI 7-05, Paragraph 13.3.1.

c. Seismic Relative Displacement D_p: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-05, Paragraph 13.3.2. Factors below must be obtained for this calculation:

1) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
2) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
3) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
4) h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
5) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
6) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedule for each component.
7) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedule for each component.
8) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a.: See Drawing Schedule for each component.

C. Wind-Load Design Calculations:
1. Perform calculations to obtain force information necessary to properly select wind-load-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-05. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise noted.

a. Factors indicated below that are specific to individual pieces of equipment must be obtained by Contractor and must be included in individual component submittal packages.
b. Coordinate design wind-load calculations with seismic load calculations for equipment requiring both seismic and wind-load reinforcement. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.

2. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:

   a. PART 1: Low-Rise Buildings.
   b. PART 2: Low-Rise Buildings (Simplified).
   c. PART 3: Buildings with "h" less than 60 feet.
   d. PART 4: Buildings with "h" greater than 60 feet and less than 160 feet.
   e. PART 5: Open Buildings.

D. Consequential Damage: Provide additional seismic and wind-load restraints for suspended fire-suppression system components or anchorage of floor-, roof-, or wall-mounted fire-suppression system components as indicated in ASCE/SEI 7-10 so that failure of a non-essential or essential fire-suppression system component will not cause the failure of any other essential architectural, mechanical, or electrical building component.

E. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

F. Component Supports:

1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
2. All component support attachments must comply with force and displacement resistance requirements of ASCE/SEI 7-05 Section 13.6.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.
   c. Korfund.
   d. Mason Industries, Inc.
   e. Vibration Eliminator Co., Inc.
   f. Or approved equal

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient and elastomeric.

a. Surface Pattern: Smooth, ribbed, or waffle pattern.
b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Isolation Technology, Inc.
b. Kinetics Noise Control, Inc.
c. Korfund.
d. Mason Industries, Inc.
e. Vibration Eliminator Co., Inc.
f. Or approved equal

2. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Korfund.
c. Mason Industries, Inc.
d. nVent (CADDY).
e. Vibration Eliminator Co., Inc.
f. Or approved equal

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 RESTRAINTS - RIGID TYPE

A. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.6 RESTRAINTS - CABLE TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton (B-line).
2. Loos & Co.
3. nVent (CADDY).
4. Vibration Mountings & Controls, Inc.
5. Or approved equal

B. Seismic-Restraint Cables: ASTM A1023/A12023M galvanized or ASTM A603 galvanized-steel ASTM A492 stainless steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

C. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.7 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton (B-line).
2. Hilti, Inc.
3. Loos & Co.
4. Mason Industries, Inc.
5. nVent (CADDY).
6. Or approved equal

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid restraints and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.8 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Atkore International (Unistrut).
   b. Eaton (B-line).
   c. Hilti, Inc.
   d. Mason Industries, Inc.
   e. Powers Fasteners.
   f. Or approved equal

2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.

B. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of ASCE/SEI 7-05, Ch. 13.

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

C. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.

1. Undercut expansion anchors are permitted.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.

B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry calculated static and seismic loads within specified loading limits.

3.2 INSTALLATION OF VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICES

A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Fire-Suppression Vibration Isolation, Seismic, and Wind-Load-Restraint Schedule, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.

B. Provide seismic-restraint devices for systems and equipment where indicated in Equipment Schedules or Vibration Isolation, Seismic, and Wind-Load-Restraint Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

D. Installation of vibration isolators and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.

E. Comply with installation requirements of NFPA 13 for installation of all seismic-restraint devices.

F. Comply with requirements in Section 077200 "Roof Accessories" for installation of equipment supports and roof penetrations.

G. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

H. Piping Restraints:

1. Comply with all requirements in NFPA 13.
2. Design piping sway bracing in accordance with NFPA 13.

    a. Maximum spacing of all sway bracing to be no greater than indicated in NFPA 13.
    b. Design loading of all sway bracing not to exceed values indicated in NFPA 13.

I. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

M. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross structural seismic joints and other points where differential movement may occur, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for piping flexible connections.

3.4 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.

C. Remove and replace malfunctioning units and retest as specified above.

D. Units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 210548

SECTION 210553 IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Or approved equal

2. Material and Thickness: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Or approved equal

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Or approved equal

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Or approved equal

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 LABEL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Piping: Painting of piping is specified in Section 099123 "Interior Painting."

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit a view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 210553

SECTION 211119 FIRE DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-type fire-department connections.
2. Flush-type fire-department connections.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Fire Hose & Cabinet.
2. Elkhart Brass Mfg. Co., Inc.
3. Fire-End & Croker Corporation.
4. Guardian Fire Equipment, Inc.
5. Or approved equal

B. Standard: UL 405.

C. Type: Exposed, projecting, for wall mounting.

D. Pressure Rating: 175 psig minimum.

E. Body Material: Corrosion-resistant metal.

F. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.

G. Caps: Brass, lugged type, with gasket and chain.

H. Escutcheon Plate: Round, brass, wall type.

I. Outlet: Back, with pipe threads.

J. Number of Inlets: Two.

K. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."

L. Finish: Polished chrome plated.

M. Outlet Size: NPS 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall-type fire-department connections.

B. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

SECTION 211200 FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection specialty valves.
3. Hose connections.
4. Alarm devices.
5. Pressure gauges.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets" for hose-connection and hose-station cabinets.
2. Section 210523 "General-Duty Valves for Water-Based Fire-Suppression Piping."
3. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire-department connections.
4. Section 211100 "Facility Fire-Suppression Water-Service Piping" for water-service piping; ductile-iron expansion joints and deflection fittings; tubular- and split-sleeve, pipe-coupling transition fittings; water meters; detector check valves; backflow preventers; and protective enclosures.
5. Section 211213 "Fire-Suppression Hoses and Nozzles" for rack-type hose stations, reel-type hose stations, and monitors.
6. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
7. Section 284621.11 "Addressable Fire-Alarm Systems" for connections to alarm devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire-suppression standpipes.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, sections, and other details, drawn to scale, or BIM model, showing the items described in this Section and coordinated with all building trades.

B. Approved Standpipe Drawings: Working plans, prepared in accordance with NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Fire-hydrant flow test report.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

F. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections, has open water-supply valve with pressure maintained, and is capable of supplying water demand.

B. Manual Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections and has small water supply to maintain water in standpipes. Piping is wet, but water must be pumped into standpipes to satisfy demand.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14.

C. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

D. High-Pressure, Fire-Suppression Standpipe System Component: Listed for 250-psig minimum working pressure.

E. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Available fire-hydrant flow test records indicate the following conditions:

    a. Date: 02/14/2019.
    b. Performed by: Michael L Willis, PE of Suez Water.
    c. Location of Residual Fire Hydrant R: #1-982 Charles Drive & Rt. 37 East.
    d. Location of Flow Fire Hydrant F: #1-99 Cedar Grove rd. & Charles Drive.
    e. Static Pressure at Residual Fire Hydrant R: 55 psig.
    f. Measured Flow at Flow Fire Hydrant F: 1996 gpm.
    g. Residual Pressure at Residual Fire Hydrant R: 38 psig.

F. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

G. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined in accordance with NFPA 13 and ASCE/SEI 7. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

H. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service in accordance with requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of fire-suppression standpipe service.
2. Do not proceed with interruption of fire-suppression standpipe service without Construction Manager's written permission.

2.3 PIPING MATERIALS

A. Comply with requirements in Part 3 "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.4 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

A. Schedule 40: ASTM A53/A53M, Type E, Grade B, with factory- or field-formed ends to accommodate joining method.

B. Schedule 30: ASTM A53/A53M, Type E, Grade B, with factory- or field-formed ends to accommodate joining method.

C. Thinwall: ASTM A53/A53M, Type E, with wall thickness of less than Schedule 30 and equal to or greater than Schedule 10, and with factory- or field-formed ends to accommodate joining method.

D. Uncoated, Steel Couplings: ASTM A865/A865M, threaded.

E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME B16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. CPS Products, Inc.
    c. Tyco by Johnson Controls Company.
    d. Victaulic Company.
    e. Or approved equal

2. Pressure Rating: 175-psig minimum.
3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A47/A47M malleable-iron casting or ASTM A536 ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110/A21.10, rubber, flat face, 1/8 inch thick.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1 carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating:

    a. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
    b. High-Pressure Piping Specialty Valves: 250-psig minimum.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Globe Fire Sprinkler Corporation.
    b. Reliable Automatic Sprinkler Co., Inc. (The).
    c. Tyco by Johnson Controls Company.
    d. Victaulic Company.
    e. Viking Corporation.
    f. Or approved equal

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, retarding chamber, and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from with check valve to main drain piping.

C. Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CLA-VAL.
    b. Elkhart Brass Mfg. Co., Inc.
    c. Fire-End & Croker Corporation.
    d. Guardian Fire Equipment, Inc.
    e. Or approved equal

2. UL 668 hose valve, with integral UL 1468 reducing device.
3. Pressure Rating: 300-psig minimum.
4. Material: Brass or bronze.
5. Inlet: Female pipe threads.
6. Outlet: Threaded with or without adapter having male hose threads.
7. Pattern: Angle or gate.
8. Finish: Rough brass or bronze.

D. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Reliable Automatic Sprinkler Co., Inc. (The).
    b. Tyco by Johnson Controls Company.
    c. Or approved equal

2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.7 HOSE CONNECTIONS

A. Nonadjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Elkhart Brass Mfg. Co., Inc.
    b. Potter Roemer LLC; a Division of Morris Group International.
    c. Tyco by Johnson Controls Company.
    d. Zurn Industries, LLC.
    e. Or approved equal

2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300-psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.

6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads in accordance with NFPA 1963 and matching local fire-department threads.
8. Pattern: Angle or gate.
9. Finish: Rough brass or bronze.

2.8 ALARM DEVICES

A. Match alarm-device material and connection types to piping and equipment materials and connection types.

B. Water-Motor-Operated Alarm:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Globe Fire Sprinkler Corporation.
   b. Tyco by Johnson Controls Company.
   c. Victaulic Company.
   d. Viking Corporation.
   e. Or approved equal

2. Standard: UL 753.
3. Type: Mechanically operated, with pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10-inch diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4.
8. Outlet: NPS 1 drain connection.

C. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fire-Lite Alarms, Inc.; a Honeywell International company.
   b. Notifier.
   c. Potter Electric Signal Company, LLC.
   d. Or approved equal

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 6-inch minimum diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.

D. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ADT Security Services, Inc.
b. Potter Electric Signal Company, LLC.
c. Viking Corporation.
d. WATTS.
e. Or approved equal

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

E. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Potter Electric Signal Company, LLC.
b. System Sensor.
c. Tyco by Johnson Controls Company.
d. Viking Corporation.
e. Or approved equal

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

F. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell International company.
b. Kennedy Valve Company; a division of McWane, Inc.
c. Potter Electric Signal Company, LLC.
d. System Sensor.
e. Or approved equal

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

G. Indicator-Post Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Potter Electric Signal Company, LLC.
    b. System Sensor.
    c. Or approved equal

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.9 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK, Inc.
2. Ashcroft Inc.
3. WIKA Instrument Corporation.
4. Or approved equal

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: Zero to 250-psig minimum.

E. Water System Piping Gauge: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories at connection to fire-suppression water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

A. Connect fire-suppression standpipe piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water supply.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping in accordance with NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gauges on riser or feed main and at top of each standpipe. Include pressure gauges with connection of not less than NPS 1/4 and with soft-metal seated globe valve,

arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

J. Fill wet-type standpipe system piping with water.

K. Install electric heating cables and pipe insulation on wet-type fire-suppression standpipe piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

M. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts in accordance with ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties in accordance with NFPA 14, authorities having jurisdiction and manufacturer's instructions.

B. Install listed fire-protection supervised-open shutoff valves, located to control sources of water supply, except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Install bypass check valve and retarding chamber drain-line connection.

3.7 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.

D. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device.

E. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for cabinets in Section 104413 "Fire Protection Cabinets."

3.8 HOSE-STATION INSTALLATION

A. Install freestanding hose stations for access and minimum passage restriction.

B. Install NPS 1-1/2 hose-station valves with flow-restricting device unless otherwise indicated.

C. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device unless otherwise indicated.

D. Install freestanding hose stations with support or bracket attached to standpipe.

E. Install wall-mounted, rack hose stations in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for cabinets in Section 104413 "Fire Protection Cabinets."

F. Install hose-reel hose stations on wall with bracket.

3.9 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping in accordance with NFPA 14 requirements.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems in accordance with NFPA 14, "System Acceptance" chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Coordinate with fire-alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.

8. Verify that equipment hose threads are same as local fire-department equipment.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.12 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 4 and smaller, shall be one of the following:

1. Schedule 40 or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40 or Schedule 30, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

C. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 5 to NPS 8, shall be one of the following:

1. Thinwall, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40 or Schedule 30, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 211200

SECTION 211313 WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Cover system for sprinkler piping.
3. Specialty valves.
4. Sprinklers.
5. Manual control stations.
6. Pressure gauges.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, or BIM model, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For qualified Installer and professional engineer.

C. Design Data:

1. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions:

a. Date: 06/26/2020.
b. Performed by: NJAWC.
c. Location of Residual Fire Hydrant R: Rahway Ave.
d. Location of Flow Fire Hydrant F: Rahway Ave.
e. Static Pressure at Residual Fire Hydrant S: 55 PSI.

f. Measured Flow at Flow Fire Hydrant F: 1126 GPM.
g. Residual Pressure at Residual Fire Hydrant R: 50 PSI.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:

1) Building Service Areas: Ordinary Hazard, Group 1.
2) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
3) Elevator Machine Room and Hoistway: Ordinary Hazard, Group 1.
4) General Storage Areas: Ordinary Hazard, Group 1.
5) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
6) Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

4. Maximum protection area per sprinkler according to UL listing.
5. Maximum Protection Area per Sprinkler:

a. Office Spaces: 225 sq. ft..
b. Storage Areas: 130 sq. ft..
c. Mechanical Equipment Rooms: 130 sq. ft..
d. Electrical Equipment Rooms: 130 sq. ft..
e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Black-Steel Pipe: ASTM A135/A135M; ASTM A795/A795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Thinwall Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Schedule 10, Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

E. Nonstandard OD, Thinwall Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M thinwall with plain ends and wall thickness less than Schedule 10.

F. Hybrid Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M lightwall, with wall thickness less than Schedule 10 and greater than Schedule 5.

G. Schedule 5 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M lightwall with plain ends.

H. Black-Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

I. Uncoated-Steel Couplings: ASTM A865/A865M, threaded.

J. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

K. Malleable- or Ductile-Iron Unions: UL 860.

L. Cast-Iron Flanges: ASME 16.1, Class 125.

M. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or EPDM rubber gasket.

    a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
    b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

N. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. CPS Products, Inc.
    c. Tyco by Johnson Controls Company.
    d. Victaulic Company.
    e. Or approved equal

2. Pressure Rating: 175-psig minimum.
3. Uncoated Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

O. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Victaulic Company.
b. Or approved equal

2.3 CPVC PIPE AND FITTINGS

A. CPVC Pipe: ASTM F442/F442M and UL 1821, SDR 13.5, for 175-psig rated pressure at 150 deg F, with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.

B. CPVC Fittings: UL listed or FM Global approved, for 175-psig rated pressure at 150 deg F, socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.

1. NPS 3/4 to NPS 1-1/2: ASTM F438 and UL 1821, Schedule 40, socket type.
2. NPS 2 to NPS 3: ASTM F439 and UL 1821, Schedule 80, socket type.
3. CPVC-to-Metal Transition Fittings: CPVC, one piece, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
4. CPVC-to-Metal Transition Unions: CPVC, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
5. Flanges: CPVC, one or two pieces.

C. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F493 solvent cement recommended by pipe and fitting manufacturer and made for joining CPVC sprinkler pipe and fittings. Include cleaner or primer recommended by pipe and fitting manufacturer.

2.4 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Specialty Valves Pressure Rating: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Globe Fire Sprinkler Corporation.
b. Reliable Automatic Sprinkler Co., Inc. (The).

c. Tyco by Johnson Controls Company.
d. Victaulic Company.
e. Or approved equal

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, retarding chamber, and fill-line attachment with strainer.
5. Drip cup assembly pipe drain without valves and separate from main drain piping

G. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco by Johnson Controls Company.
c. Or approved equal

2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.5 AIR VENT

A. Manual Air Vent/Valve:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. National Fittings, Inc.
c. Victaulic Company.
d. Or approved equal

2. Description: Ball valve that requires human intervention to vent air.
3. Body: Forged brass.
4. Ends: Threaded.
5. Minimize Size: 1/2 inch.
6. Minimum Water Working Pressure Rating: 300 psig.

B. Automatic Air Vent:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.

b. Metraflex Company (The).
c. Val-Matic Valve & Manufacturing Corp.
d. Or approved equal

2. Description: Automatic air vent that automatically vents trapped air without human intervention.
3. Standard: UL listed or FM Global approved for wet-pipe fire sprinkler systems.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

C. Automatic Air Vent Assembly:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Engineered Corrosion Solutions.
c. Potter Electric Signal Company, LLC.
d. Or approved equal

2. Description: Automaticair vent assembly that automatically vents trapped air without human intervention, including Y-strainer and ball valve in a prepiped assembly.
3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler system.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

2.6 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Anvil International.
c. National Fittings, Inc.
d. Victaulic Company.
e. Or approved equal

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing, Inc.
    b. Reliable Automatic Sprinkler Co., Inc. (The).
    c. Victaulic Company.
    d. Or approved equal

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing, Inc.
    b. Elkhart Brass Mfg. Co., Inc.
    c. Potter Electric Signal Company, LLC.
    d. Potter Roemer LLC; a Division of Morris Group International.
    e. Or approved equal

2. Standard: UL 199.
3. Pressure Rating: 175 psig.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing, Inc.
    b. Tyco by Johnson Controls Company.
    c. Victaulic Company.
    d. Or approved equal

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aegis Technologies, Inc.
    b. CECA, LLC.
    c. CPS Products, Inc.
    d. Merit Manufacturing.
    e. Or approved equal

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ALEUM USA.
    b. FlexHead Industries, Inc.
    c. Gateway Tubing, Inc.
    d. Victaulic Company.
    e. Or approved equal

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum.
5. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco by Johnson Controls Company.
4. Victaulic Company.
5. Or approved equal

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

F. Sprinkler Finishes: bronze.

G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

H. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco by Johnson Controls Company.
c. Victaulic Company.
d. Or approved equal

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 MANUAL CONTROL STATIONS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.

B. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AGF Manufacturing, Inc.

2. AMETEK, Inc.
3. Ashcroft Inc.
4. Or approved equal

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

K. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

L. Extruded-Tee Connections: Form tee in copper tube according to ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

M. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

N. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.

3.5 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and NFPA 13 or NFPA 13R for supports.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.

E. Air Vent:

1. Provide at least one air vent in each wet pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping.
2. Provide dielectric union for dissimilar metals, ball or globe valve, and strainer upstream of automatic air vent. Do not retain the first subparagraph below if dual air vents are specified under "Automatic Air Vent Assembly" Paragraph above, or if air vent assembly configuration is such that the manufacturer does not require piping of the air vent to drain.

3.7 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.11 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. CPVC pipe, Schedule 40 CPVC fittings, and solvent-cemented joints may be used for light-hazard and residential occupancies where concealed within wall or ceiling construction on residential floors of the building.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

E. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall, Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

F. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall, Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Wall Mounting: Sidewall sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 211316 DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Pressure gauges.
8. Nitrogen generator-based corrosion-mitigation systems.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dry-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For dry-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.

B. Design Data:

1. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air or nitrogen. Opening of sprinklers releases compressed air or nitrogen and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dry-pipe sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions:

    a. Date: 06/26/2020.
    b. Performed by: NJAWC.
    c. Location of Residual Fire Hydrant R: Rahway Ave.
    d. Location of Flow Fire Hydrant F: Rahway Ave.
    e. Static Pressure at Residual Fire Hydrant S: 55 PSI.
    f. Measured Flow at Flow Fire Hydrant F: 1126 GPM.
    g. Residual Pressure at Residual Fire Hydrant R: 50 PSI.

E. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

    a. Automobile Parking Areas: Ordinary Hazard, Group 1.
    b. Building Service Areas: Ordinary Hazard, Group 1.
    c. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    d. Elevator Machine Room and Hoistway: Ordinary Hazard, Group 1.
    e. General Storage Areas: Ordinary Hazard, Group 1.
    f. Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

    a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

4. Maximum protection area per sprinkler according to UL listing.
5. Maximum Protection Area per Sprinkler:

    a. Office Spaces: 225 sq. ft.
    b. Storage Areas: 130 sq. ft.
    c. Mechanical Equipment Rooms: 130 sq. ft.
    d. Electrical Equipment Rooms: 130 sq. ft.
    e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

    a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
    b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

2.3 STEEL PIPE AND FITTINGS

A. Standard-Weight, Galvanized-Steel Pipe: ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Galvanized-Steel Pipe: ASTM A135/A135M; ASTM A795/A795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Thinwall Galvanized-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Galvanized-Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

E. Galvanized-Steel Couplings: ASTM A865/A865M, threaded.

F. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME B16.1, Class 125.

I. Plain-End-Pipe Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn or screwed retainer pin to secure pipe in fitting.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. Shurjoint; a part of Aalberts Integrated piping Systems.
    c. Or approved equal

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. CPS Products, Inc.
    c. National Fittings, Inc.
    d. Shurjoint; a part of Aalberts Integrated piping Systems.
    e. Smith-Cooper International.
    f. Tyco by Johnson Controls Company.
    g. Victaulic Company.
    h. Or approved equal

2. Pressure Rating: 175-psig minimum.
3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Specialty Valves Pressure Rating: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Dry-Pipe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Globe Fire Sprinkler Corporation.
    b. Reliable Automatic Sprinkler Co., Inc. (The).
    c. Tyco by Johnson Controls Company.
    d. Victaulic Company.
    e. Viking Corporation.
    f. Or approved equal

2. Standard: UL 260.
3. Design: Differential-pressure type.
4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

G. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175-psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.5 DRY-SPRINKLER SYSTEM NITROGEN GENERATOR WITH PURGE/VENT

A. Dry-Sprinkler System Nitrogen Generator with Purge/Vent: Nitrogen generator system to serve dry-sprinkler zones for piping corrosion mitigation with system high point venting.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Engineered Corrosion Solutions.
    b. General Air Products, Inc.
    c. Potter Electric Signal Company, LLC.

d. South-Tek Systems, LLC.
e. Or approved equal

2. Description: Nitrogen generator system for dry-sprinkler system providing required supervisory pressure within sprinkler zone. System is to include either an integrated, oil-less air compressor located within nitrogen generator system package, or a separate vibration-isolation mounted air compressor, also provided by nitrogen generator manufacturer.
3. Standards:

a. FM Approvals 1035.
b. UL 508A listed.

4. Nitrogen Generator:

a. Wall-mounted or skid-mounted nitrogen generator to provide minimum nitrogen purity of 98 percent to the designated sprinkler systems.
b. Power: 120 V ac.
c. Bypass mode and nitrogen generating mode.
d. Minimum Capacity: As recommended by manufacturer.
e. .

5. Automatic Purge Vent/Valve:

a. Vents oxygen during system nitrogen fill.
b. Automatically closes when 98 percent minimum nitrogen has been reached.
c. Sized to allow correct purge rate per manufacturer's written instructions and with 14 days.
d. Provide one venting device for each dry/pre-action sprinkler system zone.
e. Include a connection port for a portable nitrogen purity sensor or a nitrogen purity manifold.

6. Supervisory Gas Monitoring - Nitrogen Purity Sensing Device:

a. Portable Handheld Nitrogen Purity Sensing Device: Portable sensing device to connect to outlet of the automatic purge/vent valve during periodic inspections to obtain a nitrogen purity reading within each zone.
b. Permanently Mounted Nitrogen Purity Monitoring Device or Manifold: Permanent monitoring device to continuously monitor system's nitrogen purity.

2.6 SPRINKLER PIPING SPECIALTIES

A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.

B. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Anvil International.
c. National Fittings, Inc.
d. Shurjoint; a part of Aalberts Integrated piping Systems.
e. Tyco by Johnson Controls Company.
f. Victaulic Company.
g. Or approved equal

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

C. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Reliable Automatic Sprinkler Co., Inc. (The).
c. Tyco by Johnson Controls Company.
d. Victaulic Company.
e. Or approved equal

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Elkhart Brass Mfg. Co., Inc.
c. Fire-End & Croker Corporation.
d. Potter Electric Signal Company, LLC.
e. Potter Roemer LLC; a Division of Morris Group International.
f. Or approved equal

2. Standard: UL 199.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Brass.

5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

E. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing, Inc.
    b. Triple R Specialty.
    c. Tyco by Johnson Controls Company.
    d. Victaulic Company.
    e. Viking Corporation.
    f. Or

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

F. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aegis Technologies, Inc.
    b. CECA, LLC.
    c. CPS Products, Inc.
    d. Merit Manufacturing.
    e. Or approved equal

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum.
4. Body Material: Steel pipe with EPDM O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

G. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ALEUM USA.
    b. FlexHead Industries, Inc.
    c. Gateway Tubing, Inc.
    d. Victaulic Company.

e. Or approved equal

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum.
5. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco by Johnson Controls Company.
4. Venus Fire Protection Ltd.
5. Victaulic Company.
6. Viking Corporation.
7. Or approved equal

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Pressure Rating for High-Pressure Automatic Sprinklers: 250-psig minimum.

F. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

G. Sprinkler Finishes: Chrome plated.

H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

I. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco by Johnson Controls Company.
c. Victaulic Company.
d. Viking Corporation.
e. Or approved equal

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 MANUAL CONTROL STATIONS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.

B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AGF Manufacturing, Inc.
2. AMETEK, Inc.
3. Ashcroft Inc.
4. Brecco Corporation.
5. WIKA Instrument Corporation.
6. Or approved equal

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0- to 250-psig minimum.

E. Label: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements in Section 211100 "Facility Fire-Suppression Water-Service Piping" for backflow preventers.

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.

K. Connect compressed-air supply to dry-pipe sprinkler piping.

L. Connect air compressor to the following piping and wiring:

1. Pressure gauges and controls.
2. Electrical power system.
3. Fire-alarm devices, including low-pressure alarm.

M. Install alarm devices in piping systems.

N. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

O. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

P. Drain dry-pipe sprinkler piping.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.

3.6 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install sprinklers with water supply from heated space. Do not install pendant or sidewall, sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Coordinate with fire-alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.
8. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends, cast-iron threaded fittings, and threaded joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, dry-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:

1. Standard-weight or Schedule 30, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, galvanized-steel pipe with roll-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Dry pendent sprinklers Dry concealed sprinklers.
3. Wall Mounting: Dry sidewall sprinklers.
4. Spaces Subject to Freezing: Upright sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

SECTION 212200 CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Clean-agent fire-extinguishing systems.
2. Pipe and fittings.
3. Valves.
4. Extinguishing-agent containers.
5. Fire-extinguishing clean agent.
6. Discharge nozzles.
7. Manifold and orifice unions.
8. Fire control panels.
9. Detection devices.
10. Manual stations.
11. Switches.
12. Alarm devices.

1.2 DEFINITIONS

A. EPO: Emergency Power Off.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Prepare in accordance with requirements of NFPA 2001, to include, but not be limited to, the following:

1. Include plans, elevations, sections, and attachment details.
2. Include design calculations.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, manufacturer-required clearances, method of field assembly, components, and location and size of each field connection.
4. Include diagrams for power, signal, and control wiring.
5. Permit-Approved Documents: Working plans and hydraulic calculations approved by authorities having jurisdiction.

C. Delegated-Design Submittal: For clean-agent fire-extinguishing systems indicated to comply with performance and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, or BIM model, drawn to scale and coordinated with all building trades. Coordinate for enclosure integrity in accordance with NFPA 2001 requirements.

B. Seismic Qualification Data: Certificates for extinguishing-agent containers and control panels, from manufacturer.

C. Welding certificates.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Approvals' "Approval Guide."

C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

2.2 CLEAN-AGENT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ansul by Johnson Controls Company.
2. Fike Corporation.
3. Siemens Industry, Inc., Building Technologies Division.
4. United Technologies Corporation (UTC Climate, Controls & Security - Kidde).
5. Or approved equal

B. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity above the ceiling, below the ceiling, and

below the raised floor. System includes separate zones above and below the ceiling and beneath the raised floor. If smoke is detected below the raised floor, extinguishing agent shall be discharged in the underfloor zone only. If smoke is detected below the ceiling, extinguishing agent shall be discharged in zones above and below the ceiling and below the floor. If smoke is detected above the ceiling, extinguishing agent shall be discharged in the zone above the ceiling only.

C. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A Class B Class C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.

D. Performance Requirements: Discharge HFC 227ea within 10 seconds and maintain 7.1 percent concentration by volume at 70 deg F for 10-minute holding time in hazard areas.

1. HFC 227ea concentration in hazard areas greater than 9.0 percent immediately after discharge or less than 5.8 percent throughout holding time will not be accepted without written authorization from Owner and authorities having jurisdiction.
2. System Capabilities: Minimum 620-psig calculated working pressure and 360-psig initial charging pressure.

E. Cross-Zoned Detection: Devices located in two separate zones. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating single-detection device in another zone.

F. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.

G. System Operating Sequence:

1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to fire-alarm system.
2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds, and discharge extinguishing agent.
3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.

H. System Operating Sequence: System shall be cross-zoned, air-sampling detectors and photoelectric detectors reporting to a fully programmable microprocessor-based control panel programmed to operate as follows:

1. If one photoelectric detector and air-sampling detector reaches the third detection level (Fire 1), agent discharge will be initiated as described for the third detection level (Fire 1) below.
2. Air-Sampling System:

a. First Detection Level (Alert): Mild audible and visual indication on annunciator panel. Strobe lights flash slowly in the protected area.
b. Second Detection Level (Action): Strong audible and visual indication on annunciator panel. Strobe lights flash rapidly in the protected area.
c. Third Detection Level (Fire 1): Strong audible and visual indication on annunciator panel. Energize horn(s), bell(s), and strobe light(s) in the protected area and outside entry doors. Shut down air-conditioning and ventilating systems serving the protected area, and close doors in the protected area. Send signal to fire-alarm system, initiate 30-second time delay for extinguishing-agent discharge, and discharge extinguishing agent. At agent discharge, terminate power to equipment in the protected area.
d. Fourth Detection Level (Fire 2): Same as Fire 1.

I. Manual stations shall immediately discharge extinguishing agent when activated.

J. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release hand pressure on the switch to cause agent discharge after the time delay has expired.

K. EPO: Will terminate power to protected equipment immediately on actuation.

L. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.

M. Power Transfer Switch: Transfer from normal to standby power source.

2.3 PIPE AND FITTINGS

A. See "HFC 227ea Agent Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

C. Steel Pipe: ASTM A53/A53M, Type S, Grade B or ASTM A106/A106M, Grade A and Grade B; Schedule 40, Schedule 80, and Schedule 160, seamless steel pipe.

1. Threaded Fittings:

a. Malleable-Iron Fittings: ASME B16.3, Class 300.
b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
c. Fittings Working Pressure: 620 psig minimum.
d. Flanged Joints: Class 300 minimum.

2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A47/A47M malleable iron or ASTM A536 ductile iron, with dimensions matching steel pipe and ends factory grooved in accordance with AWWA C606.

D. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch-maximum thickness unless thickness or specific material is indicated.

E. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.

F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

A. General Valve Requirements:

1. UL listed or FM Approved for use in fire-protection systems.
2. Compatible with type of clean agent used.

B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.

C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.

D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.

1. Finish: Red, enamel or epoxy paint.
2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.

4. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

A. HFC 227ea Clean Agent: Heptafluoropropane.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. DuPont.
b. Or approved equal

2.7 DISCHARGE NOZZLES

A. Description: Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

B. Material: Corrosion-resistant metal.

C. Stamped with orifice size and type.

2.8 FIRE CONTROL PANELS

A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120/240 V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

1. Mounting: Recessed flush with surface.

D. Supervised Circuits: Separate circuits for each independent hazard area.

1. Detection circuits equal to required number of zones, or addressable devices assigned to required number of zones.
2. Manual pull-station circuit.
3. Alarm circuit.
4. Release circuit.
5. Abort circuit.
6. EPO circuit.

E. Control-Panel Features:

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
2. Automatic switchover to standby power at loss of primary power.
3. Storage container, low-pressure indicator.
4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.

F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless steel or aluminum enclosure.

G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.9 DETECTION DEVICES

A. Description: Comply with NFPA 2001, NFPA 72, and UL 268; 24 V dc, nominal.

B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.

C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.

D. Signals to the Central Fire-Alarm Control Panel: Any type of local system trouble is reported to central fire-alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to central fire-alarm control panel as separately identified zones.

2.10 MANUAL STATIONS

A. Description: Surface FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low-voltage compatible with controls. Include contacts for connection to control panel.

B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.

C. Abort Switch: "ABORT" caption, momentary contact, with green finish.

D. EPO Switch: "EPO" caption, with yellow finish.

2.11 SWITCHES

A. Description: FM Approved or NRTL listed, where available, 120-V ac or low-voltage compatible with controls. Include contacts for connection to control panel.

1. Low-Agent Pressure Switches: Pneumatic operation.
2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
3. Door Closers: Magnetic retaining and release device or electrical interlock to cause door operator to drive the door closed.

2.12 ALARM DEVICES

A. Description: FM Approved or NRTL listed, low voltage, and surface mounting. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems" for alarm and monitoring devices.

B. Bells: Minimum 6-inch diameter.

C. Horns: 90 to 94 dBA.

D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

E. Oxygen Deficiency Monitor.

1. Sampling Method and Range: Diffusion, zero to 25 percent O_2.
2. 24 V dc.
3. Wall mounted with bracket.
4. Built-in audible alarm 90 dBA.
5. Backlit LCD.
6. 10-year no-calibration sensor.
7. No maintenance required.
8. Signal Outputs: Standard 4- to 20-mA analog.
9. Connections for system control data acquisition system and/or programmable logic controller.
10. Plus or minus 1 percent accuracy of full scale.
11. Operating temperature of minus 40 to plus 122 deg F.

PART 3 - EXECUTION

3.1 HFC 227ea AGENT PIPING APPLICATIONS

A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.

B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.

C. NPS 2-1/2 and Larger: Schedule 40, steel pipe; forged-steel welding fittings; and welded joints.

3.2 CLEAN-AGENT SYSTEM INSTALLATION

A. Install clean-agent containers, piping, and other components level and plumb, in accordance with manufacturers' written instructions.

B. Clean-Agent Container Mounting:

1. Install clean-agent containers on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."

C. Grooved Piping Joints: Groove pipe ends in accordance with AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant in accordance with manufacturer's written instructions.

D. Install pipe and fittings, valves, and discharge nozzles in accordance with requirements listed in NFPA 2001, Section "Distribution."

1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
2. Support piping using supports and methods in accordance with NFPA 13.
3. Install seismic restraints for extinguishing-agent piping systems.
4. Install control panels, detection system components, alarms, and accessories, in accordance with requirements listed in NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.3 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

E. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems."

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 IDENTIFICATION

A. Identify system components and equipment. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."

B. Identify piping, extinguishing-agent containers, other equipment, and panels in accordance with NFPA 2001.

C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.

D. Install signs at entry doors to advise persons outside the room the meaning of horn(s), bell(s), and strobe light(s) outside the protected space.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. After installing clean-agent fire-extinguishing system and after electrical circuitry has been energized, test for compliance in accordance with requirements listed in NFPA 2001, Section "Approval of Installation."
2. Clean-agent fire-extinguishing system and associated protected enclosure will be considered defective if either does not pass required tests and inspections.
3. Prepare test and inspection reports in accordance with requirements listed in NFPA 2001, Section "Installation Acceptance."

3.8 CLEANING

A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.9 OPERATIONAL CONDITION SYSTEM FILLING

A. Preparation:

1. Verify that clean-agent fire-extinguishing system and protected enclosure have passed all required tests and inspections in accordance with NFPA 2001.
2. Verify that clean-agent fire-extinguishing piping system installation is completed and cleaned.
3. Verify complete enclosure integrity.
4. Verify operation of ventilation and exhaust systems.

B. Filling Procedures:

1. Fill clean-agent fire-extinguishing containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled containers.
3. Energize circuits.
4. Adjust operating controls.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 212200

SECTION 213113 ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. End-suction fire pumps.
2. In-line fire pumps.
3. Fire-pump accessories and specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Comply with NFPA 20.

B. Seismic Performance: Fire pumps shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

C. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

A. Description: Factory-assembled and -tested fire-pump and driver unit.

B. Base: Fabricated and attached to fire-pump and driver unit, with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.

C. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.3 IN-LINE FIRE PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-C Fire Pump; a Xylem brand.
2. Patterson Pump Company; a Gorman-Rupp company.
3. Peerless Pump Company.
4. Pentair Pump Group.
5. Or approved equal

B. Pump:

1. Standard: UL 448, for in-line pumps for fire service.
2. Casing: Radially split case, cast iron, with ASME B16.1 pipe-flange connections.
3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
4. Wear Rings: Replaceable bronze.
5. Shaft and Sleeve: Steel shaft with bronze sleeve.

    a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
    b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shaft is vertical, with motor above pump and pump on base. Motor and pump rotating assembly shall be removable from top without removing the pump casing from the piping.

C. Coupling: None or rigid.

D. Driver:

1. Standard: UL 1004A.
2. Type: Electric motor; NEMA MG 1, polyphase Design B.

E. Capacities and Characteristics:

1. Rated Capacity: 500 gpm.
2. Total Rated Head: 85 psig.
3. Inlet Flange: Class 125.
4. Outlet Flange: Class 125.
5. Suction Head Available at Pump: 40 psig.
6. Motor Horsepower: 40 hp.
7. Motor Speed: 3550 rpm.
8. Electrical Characteristics:

    a. Volts: 460 V.
    b. Phase: Three.
    c. Hertz: 60.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.

B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping.

C. Relief Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CLA-VAL.
    b. WATTS.
    c. Zurn Industries, LLC.
    d. Or approved equal

2. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.

D. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.

E. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.

F. Discharge Cone: Closed or open type.

2.5 GROUT

A. Standard: ASTM C1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting:

1. Install fire pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
3. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.

D. Support piping and pumps separately, so weight of piping does not rest on pumps.

E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211313 "Wet-Pipe Sprinkler Systems."

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Section 211313 "Wet-Pipe Sprinkler Systems."

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.

H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.2 ALIGNMENT

A. Align end-suction pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

C. Align piping connections.

D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.3 CONNECTIONS

A. Comply with requirements for piping and valves specified in Section 211313 "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect flowmeter-system meters, sensors, and valves to tubing.

E. Connect fire pumps to their controllers.

3.4 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.5 FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Section 2623933 "Controllers for Fire-Pump Drivers."

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
2. Test according to NFPA 20 for acceptance and performance testing.

3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

E. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION 213113

SECTION 213413 PRESSURE-MAINTENANCE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Regenerative-turbine, pressure-maintenance pumps.
2. Vertical-turbine, pressure-maintenance pumps.

B. Related Requirements:

1. Section 262933 "Controllers for Fire-Pump Drivers" for pressure-maintenance-pump controllers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For pumps, accessories, and specialties.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 VERTICAL-TURBINE, PRESSURE-MAINTENANCE PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-C Fire Pump; a Xylem brand.
2. Aurora Pump; Pentair Ltd.
3. Peerless Pump Company.
4. Ruhrpumpen, Inc.
5. Or approved equal

B. Description: Factory-assembled and -tested, vertical, multistage, open-line-shaft turbine pump as defined in HI 2.1-2.2 and HI 2.3; with pump motor mounted above pump head.

C. Pump Construction:

1. Pump Head: Cast iron, for surface discharge, with flange except connections may be threaded in sizes in which flanges are not available.
2. Pump Head Seal: Stuffing box and stuffing.
3. Line Shaft: Stainless steel or steel, with corrosion-resistant shaft sleeves.
4. Line Shaft Bearings: Rubber sleeve, water lubricated.
5. Line Shaft: Steel.
6. Line Shaft Bearings: Corrosion resistant, oil lubricated.
7. Impeller Shaft: Monel metal or stainless steel.
8. Bowl Section: Multiple cast-iron bowls with closed-type bronze or stainless-steel impellers.
9. Column Pipe: ASTM A53/A53M, Schedule 40, galvanized-steel pipe with threaded ends and cast-iron or steel fittings, in sections 10 feet or less, with strainer of cast or fabricated bronze or stainless steel at bottom.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Motor: Single speed with permanently lubricated ball bearings. Comply with requirements in Section 210513 "Common Motor Requirements for Fire Suppression Equipment."

1. Power Cord: Factory-connected to motor for field connection to controller and at least 10 feet long.

F. Base: Cast iron or steel with hole for electrical cable.

G. Nameplate: Permanently attached to pump and indicating capacity and characteristics.

H. Capacities and Characteristics:

1. Rated Capacity: 5 gpm.
2. Total Dynamic Head: 157 feet.
3. Working Pressure: 175 psig.
4. Inlet Size: 1-1/4” NPS.
5. Outlet Size: 1-1/4” NPS.
6. Flange: Class 125.
7. Suction Head Available at Pump: 74 feet.
8. Motor Horsepower: 1.0.
9. Motor Speed: 3500 RPM.
10. Electrical Characteristics:

a. Volts: 240.
b. Phases: Three.
c. Hertz: 60.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 210513 "Common Motor Requirements for Fire Suppression Equipment."

1. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. NFPA Standard: Comply with NFPA 20 for installation of pressure-maintenance pumps.

B. Equipment Mounting:

1. Install regenerative-turbine, pressure-maintenance pumps according to HI 1.4.
2. Install vertical-turbine, pressure-maintenance pumps according to HI 2.4.
3. Install base-mounted pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

    a. Comply with requirements for vibration isolation and seismic control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
    b. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."
    c. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
    d. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    e. Install anchor bolts to elevations required for proper attachment to supported equipment.
    f. Attach pumps to equipment base using anchor bolts.
    g. Shim pumps as needed to make them level.

4. Install isolation valves in both inlet and outlet pipes near the pump. Comply with requirements for valves specified in Section 211313 "Wet-Pipe Sprinkler Systems."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Pressure-maintenance pumps will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.3 ADJUSTING

A. Lubricate pumps as recommended by manufacturer.

B. Set field-adjustable pressure-switch ranges as indicated.

END OF SECTION 213413

SECTION 220500 COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code—Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

I. Mechanically Formed Extruded Outlets in Copper Tube – "T-Drill"

1. Mechanically formed extruded outlets shall comply with the following:

   a. ASME B31.9, ASTM F 2014-00, IPC 2015, IMC 2015, NSPC.

2. Mechanically formed extruded outlets shall be perpendicular to the axis of the run tube (header). They shall be formed by drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch wall.

3. Branch tubes shall not restrict the flow in the run tube. To ensure this by conforming the branch tube to the shape of the inner curve of the run tube, a dimple / depth stop shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed 0.25 inch above the first dimple. Dimples shall be aligned with the tube run.

4. Branches can be formed up to the run tube size as shown in ASTM F 2014. Forming procedures shall be in accordance with the tool manufacturer's recommendations.

5. Joints shall be made with the use of approved brazing alloys BCup2 thru BCup5 (0-15% silver content). brazed with a filler that has a melting point above 540 deg Centigrade (1000 deg F). Soft soldered joints are not allowed.

6. K, L, M and DWV copper types allowed.

7. Soft and Hard copper allowed.

8. Each model used for making branch connections shall be permanently marked with manufacturer's name and appropriate model number.

9. Mechanically formed extruded outlets can (but not limited to) be used on commercial and residential buildings.

10. Fitter / Plumber shall be trained and certified by "T-Drill" to operate the equipment.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.
g. Or approved equal.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Eslon Thermoplastics.
b. Or approved equal.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Thompson Plastics, Inc.
b. Or approved equal.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:

a. NIBCO INC.
b. NIBCO, Inc.; Chemtrol Div.
c. Or approved equal.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Manufacturers:

    a. Cascade Waterworks Mfg. Co.
    b. Fernco, Inc.
    c. Mission Rubber Company.
    d. Plastic Oddities, Inc.
    e. Or approved equal.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:

    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Epco Sales, Inc.
    d. Watts Industries, Inc.; Water Products Div.
    e. Or approved equal.

D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.
    e. Or approved equal.

2. Separate companion flanges and steel bolts and nuts shall have 150-psig minimum working pressure where required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

    a. Calpico, Inc.

b. Lochinvar Corp.
c. Or approved equal.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.
e. Or approved equal.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated “wall pipe” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping

systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.

Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Concrete base construction shall be as designed and specified by the structural contract documents.
2. Anchor equipment to concrete bases in accordance with contract documents and manufacturer’s written instructions.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment

base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 220500

SECTION 220517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section.
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service

piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves, PVC-pipe sleeves.

5. Interior Partitions:

   a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves, PVC-pipe sleeves.

END OF SECTION 220517

SECTION 220518 ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. Jones Stephens Corp.
4. Keeney Manufacturing Company (The).
5. ProFlo; a Ferguson Enterprises, Inc. brand.
6. Or approved equal

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated [**polished brass**] finish.
d. Insulated Piping: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
f. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
h. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: Split floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

SECTION 220519 METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Inc.
2. Ernst Flow Industries.
3. Marsh Bellofram.

4. Miljoco Corporation.
5. Or approved equal

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.
2. Case: Cast aluminum; 6-inch nominal size.
3. Case Form: Back angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass or plastic.
7. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 3/4 inch, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.

2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ametek U.S. Gauge.
    b. Ashcroft Inc.
    c. Ernst Flow Industries.
    d. Trerice, H. O. Co.
    e. Or approved equal

2. Standard: ASME B40.100.
3. Case: Liquid-filled Sealed Open-front, pressure relief type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.

2. Metal case, compact-style, liquid-in-glass type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.4 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Liquid-filled,-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:

1. Liquid-filled,-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Liquid-filled, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi.

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION 220519

SECTION 220523.12 BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for solder-joint connections.
4. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, One-Piece:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. KITZ Corporation.
    b. Or approved equal

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 400 psig.
    c. Body Design: One piece.
    d. Body Material: Forged brass or bronze.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass or stainless steel.
    h. Ball: Chrome-plated brass or stainless steel.
    i. Port: Reduced.

B. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Valve, Inc.
    b. Apollo Flow Controls; Conbraco Industries, Inc.
    c. Crane; a Crane brand.
    d. Elkhart Products Corporation.
    e. Or approved equal

2. Description:

    a. Standard: MSS SP-110 or MSS SP-145.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Forged brass.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Brass.

h. Ball: Chrome-plated brass.
i. Port: Full.

C. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Press Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Crane; a Crane brand.
d. NIBCO INC.
e. WATTS.
f. Or approved equal

2. Description:

a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: Minimum 200 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Press.
f. Press Ends Connection Rating: Minimum 200 psig.
g. Seats: PTFE or RPTFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.
k. O-Ring: Buna-N or EPDM.

D. Brass Ball Valves, Two-Piece with Regular Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. WATTS.
e. Or approved equal

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.

h. Ball: Chrome-plated brass.
i. Port: Regular.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.
d. Or approved equal

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Crane; a Crane brand.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.
f. Or approved equal

2. Description:

a. Standard: MSS SP-110 or MSS-145.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.

g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

C. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Press Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. WATTS.
e. Or approved equal

2. Description:

a. Standard: MSS SP-110 or MSS-145.
b. CWP Rating: Minimum 200 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Press.
f. Press Ends Connections Rating: Minimum 200 psig.
g. Seats: PTFE or RTPFE.
h. Stem: Bronze or brass.
i. Ball: Chrome-plated brass.
j. Port: Full.
k. O-Ring Seal: EPDM or Buna-N.

D. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. DynaQuip Controls.
c. NIBCO INC.
d. WATTS.
e. Or approved equal

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze or brass.

h. Ball: Chrome-plated brass.
i. Port: Regular.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valves, one piece.
3. Bronze ball valve, one piece with bronze trim.
4. Brass ball valves, two-piece with full port and brass trim.
5. Bronze ball valves, two-piece with full port and bronze or brass trim.

3.4 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve, one piece.
3. Bronze ball valve with bronze trim, one piece.
4. Brass ball valves, two-piece with full port and brass trim.

5. Bronze ball valves, two-piece with full port and bronze or brass trim.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass ball valve, one piece. Provide with threaded or solder-joint ends.
2. Bronze ball valve, one piece with bronze trim. Provide with threaded or solder-joint ends.
3. Brass ball valves, two-piece with full port and brass trim. Provide with threaded solder or press connection-joint ends.
4. Bronze ball valves, two-piece with full port and bronze or brass trim. Provide with threaded solder or press-connection-joint ends.

END OF SECTION 220523.12

SECTION 220523.14 CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze swing check valves.
2. Bronze swing check valves, press ends.
3. Iron swing check valves.
4. Iron swing check valves with closure control.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Crane; a Crane brand.
d. NIBCO INC.
e. WATTS.
f. Or approved equal

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Crane; a Crane brand.
c. NIBCO INC.
d. Stockham; a Crane brand.
e. WATTS.
f. Or approved equal

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

C. Bronze Swing Check Valves, Press Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. Elkhart Products Corporation.
    c. Milwaukee Valve Company.
    d. NIBCO INC.
    e. Or approved equal

2. Description:

    a. Standard: MSS SP-80 and MSS SP-139.
    b. CWP Rating: Minimum 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B584, bronze.
    e. Ends: Press.
    f. Press Ends Connection Rating: Minimum 200 psig
    g. Disc: Brass or bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; metal-seat or resilient-seat check valves.
c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered or press-ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Horizontal and Vertical Applications: Bronze swing check valves with bronze disc, Class 125, with soldered or threaded end connections.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze swing check valves bronze disc, Class 125, with soldered or threaded end connections.
2. Bronze swing check valves with press-end connections.

END OF SECTION 220523.14

SECTION 220523.15 GATE VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze gate valves.
2. Iron gate valves.
3. Chainwheels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. RS Valves in Insulated Piping: With 2-inch stem extensions.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

A. Bronze Gate Valves, NRS, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Valve, Inc.
    b. Apollo Flow Controls; Conbraco Industries, Inc.
    c. NIBCO INC.
    d. WATTS.
    e. Or approved equal

2. Description:

    a. Standard: MSS SP-80, Type 1.
    b. CWP Rating: 200 psig.
    c. Body Material: Bronze with integral seat and screw-in bonnet.
    d. Ends: Threaded or solder joint.
    e. Stem: Bronze.
    f. Disc: Solid wedge; bronze.
    g. Packing: Asbestos free.
    h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Gate Valves, RS, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Valve, Inc.
    b. Apollo Flow Controls; Conbraco Industries, Inc.
    c. Crane; a Crane brand.
    d. NIBCO INC.
    e. Or approved equal

2. Description:

    a. Standard: MSS SP-80, Type 2.
    b. CWP Rating: 200 psig.
    c. Body Material: Bronze with integral seat and screw-in bonnet.
    d. Ends: Threaded or solder joint.
    e. Stem: Bronze.
    f. Disc: Solid wedge; bronze.
    g. Packing: Asbestos free.
    h. Handwheel: Malleable iron, bronze, or aluminum.

C. Bronze Gate Valves, Press Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Elkhart Products Corporation.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Or approved equal

2. Description:

a. Standard: MSS SP-80 and MSS SP-139.
b. CWP Rating: Minimum 200 psig.
c. Body Material: Bronze with integral seat and union-ring bonnet.
d. Ends: Press.
e. Press Ends Connection Rating: Minimum 200 psig.
f. Stem: Brass or bronze non-rising.
g. Disc: Solid wedge; bronze.
h. Packing: Graphite.
i. Port: Full.
j. Handwheel: Malleable iron, bronze, or aluminum.

2.3 IRON GATE VALVES

A. Iron Gate Valves, NRS, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Flow Controls; Conbraco Industries, Inc.
b. Crane; a Crane brand.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Or approved equal

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.
c. Body Material: Gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

B. Iron Gate Valves, OS&Y, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc.
    b. Crane; a Crane brand.
    c. Milwaukee Valve Company.
    d. NIBCO INC.
    e. Or approved equal

2. Description:

    a. Standard: MSS SP-70, Type I.
    b. CWP Rating: 200 psig.
    c. Body Material: Gray iron with bolted bonnet.
    d. Ends: Flanged.
    e. Trim: Bronze.
    f. Disc: Solid wedge.
    g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use gate valves for shutoff service only.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze gate valves, NRS, Class 125 with soldered ends.
2. Bronze gate valves, press ends.

B. Pipe NPS 2-1/2 and Larger: Iron gate valves, NRS, Class 125 with flanged ends.

END OF SECTION 220523.15

SECTION 220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Pipe-positioning systems.
6. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psig ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hilti, Inc.
    b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    c. MKT Fastening, LLC.
    d. Simpson Strong-Tie Co., Inc.
    e. Or approved equal

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton (B-line).
    b. Empire Tool and Manufacturing Co., Inc.
    c. Hilti, Inc.
    d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    e. MKT Fastening, LLC.
    f. Or approved equal

2. Indoor Applications: Zinc-coated or stainless steel.
3. Outdoor Applications: Stainless steel.

2.6 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.8 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal hanger-shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Craftmark Pipe Markers.
    f. Or approved equal

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.

9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Or approved equal

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Or approved equal

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

PART 3 - EXECUTION

3.1 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.2 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping

   a. Background: Safety green.
   b. Letter Colors: White.

2. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Safety black.
   b. Letter Color: White.

END OF SECTION 220553

SECTION 220719 PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Domestic chilled-water piping for drinking fountains.
5. Sanitary waste piping exposed to freezing conditions.
6. Storm-water piping exposed to freezing conditions.
7. Roof drains and rainwater leaders.
8. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation" for equipment insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material test reports.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Comply with ASTM C552.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Pittsburgh Corning Corporation.
b. Or approved equal

2. Preformed Pipe Insulation: Type II, Class 1, without jacket.
3. Preformed Pipe Insulation: Type II, Class 2, with factory-applied ASJ jacket.
4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA.
b. Armacell LLC.
c. K-Flex USA.
d. Or approved equal

H. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Manson Insulation Inc.
d. Owens Corning.
e. Or approved equal

2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ.
3. 850 deg F.
4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C534/C534M or ASTM C1427, Type I, Grade 1, for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armacell LLC.
b. Or approved equal

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Foster Brand; H. B. Fuller Construction Products.

C. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA.
b. Armacell LLC.
c. Foster Brand; H. B. Fuller Construction Products.
d. K-Flex USA.
e. Or approved equal

2. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less as tested in accordance with ASTM E84.
3. Wet Flash Point: Below 0 deg F.
4. Service Temperature Range: 40 to 200 deg F.
5. Color: Black.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Or approved equal

E. ASJ Adhesive and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Or approved equal

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dow Consumer Solutions.
b. Johns Manville; a Berkshire Hathaway company.
c. P.I.C. Plastics, Inc.
d. Speedline Corporation.
e. Or approved equal

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.
d. Vimasco Corporation.
e. Or approved equal

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements.

5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.
d. Mon-Eco Industries, Inc.
e. Vimasco Corporation.
f. Or approved equal

2. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
3. Service Temperature Range: 0 to plus 180 deg F Minus 20 to plus 180 deg F.
4. Color: White.

2.4 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Pittsburgh Corning Corporation.
e. Or approved equal

2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 58 to plus 176 deg F.
4. Color: White or gray.

C. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Mon-Eco Industries, Inc.
d. Or approved equal

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

D. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Or approved equal

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Johns Manville; a Berkshire Hathaway company.
   b. P.I.C. Plastics, Inc.
   c. Proto Corporation.
   d. Speedline Corporation.
   e. Or approved equal

2. Adhesive: As recommended by jacket material manufacturer.

3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Avery Dennison Corporation, Specialty Tapes Division.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.
    e. Or approved equal

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Avery Dennison Corporation, Specialty Tapes Division.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.
    e. Or approved equal

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Or approved equal

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Avery Dennison Corporation, Specialty Tapes Division.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.
    e. Or approved equal

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A240/A240M, Type 304; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
2. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Buckaroos, Inc.
    b. Just Manufacturing.
    c. McGuire Manufacturing.
    d. MVG Molded Products.
    e. Truebro.
    f. Or approved equal

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Truebro.
    b. Zurn Industries, LLC.
    c. Or approved equal

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range of between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe

insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as that of pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as that of pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless steel jackets.

3.11 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Engage a qualified testing agency to perform tests and inspections.

C. Perform tests and inspections.

D. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

E. All insulation applications will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:

   a. Flexible Elastomeric: 1/2 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   c. Polyolefin: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:

a. Flexible Elastomeric: 3/4 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 1 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 1 inch thick.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
c. Polyolefin: 3/4 inch thick.

END OF SECTION 220719

SECTION 221116 DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Ductile-iron pipe and fittings.
3. Piping joining materials.
4. Encasement for piping.
5. Transition fittings.
6. Dielectric fittings.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

B. Coordination Drawings: Plumbing systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from the installers of the items involved:

1. Domestic water piping.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B88, Type L water tube, annealed temper.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint, press-connect, or threaded ends.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

F. Copper Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by Viega LLC; ProPress or comparable products by one of the following:

    a. Apollo Flow Controls; Conbraco Industries, Inc., ApolloXpress.
    b. Elkhart Products Corporation.
    c. NIBCO INC.
    d. Or approved equal

2. Fittings for NPS 2 and Smaller: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
3. Fittings for NPS 2-1/2 to NPS 4: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
4. Press Ends: Unpressed fitting identification feature to the fitting wall.
5. Sealing Element: EPDM.

G. Cast Copper Alloy Pipe Flanges with Press-Connect Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC; ProPress Copper or comparable products by one of the following:

    a. NIBCO INC.

b. Or approved equal

2. Flanges: ASME B 16.24, Class 150, powder coated steel plate; two-piece design.
3. NPS 2-1/2 thru NPS 4 Fittings: Stainless steel grip ring and EPDM O-ring seal in each end.
4. Housing: Copper or bronze.
5. Press Ends: Unpressed fitting identification feature to the fitting wall.
6. Sealing Element: EPDM.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51.
2. Push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

E. Standard-Pattern, Push-on-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Gaskets: AWWA C111/A21.11, rubber.

F. Compact-Pattern, Push-on-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Gaskets: AWWA C111/A21.11, rubber.

G. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys.

D. Flux: ASTM B813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. HART Industrial Unions, LLC.
e. Jomar Valve.
f. Matco-Norca.
g. WATTS.
h. Wilkins.
i. Zurn Industries, LLC.
j. Or approved equal

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint, or press-connect joint, copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.

c. Matco-Norca.
d. WATTS.
e. Wilkins.
f. Zurn Industries, LLC.
g. Or approved equal

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint, threaded, or press-connect, copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elster Perfection Corporation.
b. Grinnell Mechanical Products.
c. Matco-Norca.
d. Precision Plumbing Products.
e. Victaulic Company.
f. Or approved equal

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube in PE encasement according to ASTM A674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

H. Install domestic water piping level and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

F. Press-Connect Joints for Copper Tubing: Join copper tube and pressure-connect fittings with tools recommended by fitting manufacturer.

1. Mark proper insertion depth prior to making press connection.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

3.4 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits or nipples.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.

5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment (ManaBloc/MiniBloc): Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.
    e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller shall be the following:

1. Soft copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings and copper press-connect fittings; and press-connect joints.

E. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Mechanical-joint, ductile-iron pipe; standard or compact pattern, mechanical-joint fittings; and mechanical joints.

F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B88, Type L wrought-copper, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B88, Type L copper press-connect fittings; and press-connect joints.

G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B88, Type L wrought-copper, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B88, Type L; copper press-connect fittings; and press-connect joints.

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use ball or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop or Thermostatic balancing valves. Refer to Drawing Schedule.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221119 DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Outlet boxes.
8. Hose stations.
9. Hose bibbs.
10. Wall hydrants.
11. Drain valves.
12. Water-hammer arresters.
13. Air vents.
14. Trap-seal primer valves.
15. Trap-seal primer systems.
16. Specialty valves.
17. Flexible connectors.
18. Water meters.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
4. Section 224713 "Drinking Fountains" for water filters for water coolers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance as required by authorities having jurisdiction:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."
3. Comply with NSF 372, "Drinking Water System Components – Lead Content."

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 35XL (Lead-Free) or comparable product by one of the following:

a. Conbraco Industries, Inc.
b. Watts; a Watts Water Technologies company.
c. Or approved equal

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 2, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model BFP-8F or comparable product by one of the following:

a. Cash Acme; a division of Reliance Worldwide Corporation.
b. Watts; a Watts Water Technologies company.
c. Or approved equal

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

C. Laboratory-Faucet Vacuum Breakers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 730 or comparable product by one of the following:

a. Conbraco Industries, Inc.
b. Watts; a Watts Water Technologies company.
c. Or approved equal

2. Standard: ASSE 1035.
3. Size: NPS 1/4 or NPS 3/8 matching faucet size.
4. Body: Bronze.
5. End Connections: Threaded.
6. Finish: Chrome plated.

D. Spill-Resistant Vacuum Breakers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 460 or comparable product by one of the following:

a. Conbraco Industries, Inc.
b. Watts; a Watts Water Technologies company.
c. Or approved equal

2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.

4. Size: NPS 1/4 to NPS 25, as required to match connected piping.
5. Accessories:

    a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 760 or comparable product by one of the following:

    a. Cash Acme; a division of Reliance Worldwide Corporation.
    b. Watts; a Watts Water Technologies company.
    c. Or approved equal

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/2 to NPS 3/4, as required to match connected piping.
5. Body: Bronze.
6. End Connections: Union, solder joint.
7. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins: Model 375A (Lead-Free) or comparable product by one of the following:

    a. Conbraco Industries, Inc.
    b. Watts; a Watts Water Technologies company.
    c. Or approved equal

2. Standard: ASSE 1013, CSA B64.4, IAPMO, USC FCCCHR, UL Listed, FMG approved, and AWWA C511.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: NPS 1/2 to NPS 10.
6. Body: Bronze for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger:

        1) Valve Type: Non-rising stem gate valves.
        2) End Connection: Flanged end connections.

    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

d. Strainer Option: Cast iron wye strainer.

C. Double-Check, Backflow-Prevention Assemblies:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 350A (Lead-Free) or comparable product by one of the following:

   a. Conbraco Industries, Inc.
   b. Watts; a Watts Water Technologies company.
   c. Or approved equal

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Size: NPS 1/2 to NPS 12.
6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal flow.
8. Accessories:

   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   b. Valves NPS 2-1/2 and Larger:

      1) Valve Type: Non-rising stem gate valves.
      2) End Connection: Flanged end connections.

   c. Strainer Option: Epoxy coated wye strainer.

D. Beverage-Dispensing-Equipment Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 375ST (Lead-Free) or comparable product by one of the following:

   a. Conbraco Industries, Inc.
   b. Watts; a Watts Water Technologies company.
   c. Or approved equal

2. Standard: ASSE 1022.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/4 to NPS 1.
5. Body: Stainless steel.
6. End Connections: Threaded.

E. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Conbraco Industries, Inc.
b. Watts; a Watts Water Technologies company.
c. Woodford Manufacturing Company; a division of WCM Industries, Inc.
d. Or approved equal

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 70XL (Lead-Free) or comparable product by one of the following:

a. Cash Acme; a division of Reliance Worldwide Corporation.
b. Watts; a Watts Water Technologies company.
c. Or approved equal

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: NPS 1/2 to NPS 3.
5. Body: Bronze.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded.

B. Water-Control Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model ZW204 (Lead-Free) or comparable product by one of the following:

a. CLA-VAL.
b. OCV Control Valves.
c. Or approved equal

2. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
3. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

a. Size: NPS 1-1/2 to NPS 10.
b. Pattern: Globe-valve design.

c. Trim: Stainless steel.

5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Conbraco Industries, Inc.
   b. Bell & Gossett
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Crane Co.; Crane Valve Group; Jenkins Valves.
   e. Crane Co.; Crane Valve Group; Stockham Div.
   f. Hammond Valve.
   g. Milwaukee Valve Company.
   h. NIBCO Inc.
   i. Red-White Valve Corp.
   j. Or approved equal

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model ZW1017XL (Lead-Free) or comparable product by one of the following:

   a. Leonard Valve Company.
   b. Powers; a division of Watts Water Technologies, Inc.
   c. Or approved equal

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.

5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Rough bronze.

B. Individual-Fixture, Water Tempering Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model ZW3870XLT (Lead-Free) or comparable product by one of the following:

    a. Cash Acme; a division of Reliance Worldwide Corporation.
    b. Watts; a Watts Water Technologies company.
    c. Or approved equal

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
    c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Light Commercial Products; or comparable product by one of the following:

a. Acorn Engineering Company.
b. Guy Gray Manufacturing Co., Inc.
c. IPS Corporation.
d. LSP Products Group, Inc.
e. Oatey.
f. Plastic Oddities.
g. Symmons Industries, Inc.
h. Watts; a Watts Water Technologies company.
i. Whitehall Manufacturing; a div. of Acorn Engineering Company.
j. Or approved equal

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel, epoxy-painted-steel, or plastic box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 1-1/2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch-long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Acorn Engineering Company.
b. IPS Corporation.
c. LSP Products Group, Inc.
d. Oatey.
e. Plastic Oddities.
f. Or approved equal

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel, epoxy-painted-steel, or plastic box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.10 HOSE STATIONS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARCHON Industries, Inc.
2. Armstrong International, Inc.
3. Cooney Brothers, Inc.
4. DynaFluid Ltd.
5. Leonard Valve Company.
6. Strahman Valves, Inc.
7. T & S Brass.
8. Or approved equal

2.11 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.12 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Light Commercial Products or comparable product by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Woodford Manufacturing Company; a division of WCM Industries, Inc.
    c. Or approved equal

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.

7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): Two with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Specification Drainage Products; Z1325 or comparable product by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Woodford Manufacturing Company; a division of WCM Industries, Inc.
    c. Or approved equal

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Vacuum Breaker:

    a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

11. Operating Keys(s): Two with each wall hydrant.

2.13 DRAIN VALVES

A. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.14 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Specification Drainage Products; Z1700 or comparable product by one of the following:

    a. Precision Plumbing Products, Inc.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Or approved equal

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.15 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.16 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Z1021 or comparable product by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Watts; a Watts Water Technologies company.
    c. Precision Piping Products.
    d. Or approved equal

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.

4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.17 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Z1020XL or comparable product by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Precision Piping Products
    c. Watts; a Watts Water Technologies company.
    d. Or approved equal

2. Standard: ASSE 1044.
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Surface-mounted steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.

    a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. Vacuum Breaker: ASSE 1001.
7. Size Outlets: NPS 1/2.

2.18 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Flex Pression, Ltd.
4. Flex-Weld Incorporated.
5. Hyspan Precision Products, Inc.
6. Mercer Gasket & Shim, Inc.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. TOZEN Corporation.
10. Unaflex.Universal Metal Hose; a Hyspan company
11. Or approved equal

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

2.19 WATER METERS

A. Displacement-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AALIANT; a Venture Measurement product line.
b. ABB.
c. Badger Meter, Inc.
d. Carlon Meter.
e. Mueller Co. Ltd.; a subsidiary of Mueller Water Products Inc.
f. Schlumberger Limited; Water Services.
g. Sensus.
h. Or approved equal

2. Description:

a. Standard: AWWA C700.
b. Pressure Rating: 150-psig working pressure.
c. Body Design: Nutating disc; totalization meter.
d. Registration: In gallons or as required by utility company.
e. Case: Bronze.
f. End Connections: Threaded.

B. Turbine-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AALIANT; a Venture Measurement product line.
b. ABB.
c. Badger Meter, Inc.
d. Hays Fluid Controls.
e. Master Meter, Inc.
f. McCrometer, Inc.
g. Mueller Co. Ltd.; a subsidiary of Mueller Water Products Inc.
h. Schlumberger Limited; Water Services.
i. SeaMetrics Inc.
j. Sensus.
k. Or approved equal

2. Description:

a. Standard: AWWA C701.
b. Pressure Rating: [150-psig working pressure.
c. Body Design: Turbine; totalization meter.
d. Registration: In gallons, or as required by utility company.
e. Case: Bronze.
f. End Connections for Meters NPS 2 and Smaller: Threaded.
g. End Connections for Meters NPS 2-1/2 and Larger: Flanged.

C. Compound-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABB.
b. Badger Meter, Inc.
c. Master Meter, Inc.
d. Mueller Co. Ltd.; a subsidiary of Mueller Water Products Inc.
e. Schlumberger Limited; Water Services.
f. Sensus.
g. Or approved equal

2. Description:

a. Standard: AWWA C702.
b. Pressure Rating: 150-psig working pressure.
c. Body Design: With integral mainline and bypass meters; totalization meter.
d. Registration: In gallons or as required by utility company.
e. Case: Bronze.
f. Pipe Connections: Flanged.

D. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

E. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve and pump.

G. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

H. Install hose stations with check stops or shutoff valves on inlets and with thermometer on outlet.

I. Install water-hammer arresters in water piping according to PDI-WH 201.

J. Install air vents at high points of water piping.

K. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

L. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

M. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Double-check, backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
8. Water pressure-reducing valves.
9. Calibrated balancing valves.
10. Primary, thermostatic, water mixing valves.
11. Outlet boxes.
12. Hose stations.
13. Supply-type, trap-seal primer valves.
14. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each reduced-pressure-principle backflow preventer and double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221123 FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 5 psig.

B. Natural-Gas System Pressure within Buildings: More than 0.5 psig but not more than 2 psig.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters.
6. Dielectric fittings.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.

B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

C. Qualification Data: For qualified professional engineer.

D. Welding certificates.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For motorized gas valves, pressure regulators, and service meters to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.10 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.11 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.
    f. Or approved equal

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Brass Craft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.
    f. Or approved equal

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lee Brass Company.
    b. McDonald, A. Y. Mfg. Co.
    c. Or approved equal

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Flowserve.
    b. Homestead Valve; a division of Olson Technologies, Inc.
    c. McDonald, A. Y. Mfg. Co.
    d. Milliken Valve Company.
    e. Mueller Co.; Gas Products Div.
    f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
    g. Or approved equal

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ASCO Power Technologies, LP; Division of Emerson.
    b. Dungs, Karl, Inc.
    c. Eaton Corporation; Controls Div.
    d. Eclipse Combustion, Inc.
    e. Honeywell International Inc.
    f. Johnson Controls.
    g. Or approved equal

2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. Electrical operator for actuation by appliance automatic shutoff device.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Actaris.
    b. American Meter Company.
    c. Eclipse Combustion, Inc.
    d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
    e. Invensys.
    f. Maxitrol Company.
    g. Richards Industries; Jordan Valve Div.
    h. Or approved equal

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 5 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Canadian Meter Company Inc.
    b. Eaton Corporation; Controls Div.
    c. Harper Wyman Co.
    d. Maxitrol Company.
    e. SCP, Inc.
    f. Or approved equal

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 5 psig.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilkins; a Zurn company; Model DUBI or comparable product by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. Jomar International Ltd.
    e. Matco-Norca, Inc.
    f. McDonald, A. Y. Mfg. Co.
    g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    h. Or approved equal

2. Description:

    a. Standard: ASSE 1079.
    b. Pressure Rating: 125 psig.
    c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilkins; a Zurn company; Model DUBI or comparable product by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Matco-Norca, Inc.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    e. Or approved equal

2. Description:

    a. Standard: ASSE 1079.
    b. Factory-fabricated, bolted, companion-flange assembly.
    c. Pressure Rating: 125 psig minimum at 180 deg F.
    d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Install fittings for changes in direction and branch connections.

E. Install pressure gage downstream of each service regulator. Pressure gages are specified in Section 220519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
3. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

4. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 220519 "Meters and Gages for Plumbing Piping."

W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.5 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground**,** on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies. Comply with requirements in Section 055000 "Metal Fabrications" for pipe bollards.

3.6 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.7 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.8 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.9 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 PAINTING

A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel semigloss.

d. Color: Pipe – Safety Yellow, Accessories - Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.14 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.15 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be the following:

1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

C. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.17 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG:

A. Aboveground, branch piping NPS 1 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.18 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground:

1. PE valves.
2. NPS 2 and Smaller: Bronze plug valves.
3. NPS 2-1/2 and Larger: Cast-iron, lubricated plug valves.

3.19 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 231123

SECTION 221316 SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections:

1. Section 226600 "Chemical-Waste Systems for Laboratory and Healthcare Facilities" for chemical-waste and vent piping systems.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ANACO-Husky.
    b. Dallas Specialty & Mfg. Co.
    c. Fernco Inc.
    d. Matco-Norca, Inc.
    e. MIFAB, Inc.
    f. Mission Rubber Company; a division of MCP Industries, Inc.
    g. Stant.
    h. Tyler Pipe.
    i. Or approved equal

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Steel Pipe Pressure Fittings:

1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

C. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anvil International; a subsidiary of Mueller Water Products, Inc.
b. Grinnell Mechanical Products.
c. Shurjoint Piping Products.
d. Victaulic Company.
e. Or approved equal

2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47/A 47M malleable-iron castings, ASTM A 234/A 234M forged steel fittings, or ASTM A 106/A 106M steel pipes with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.
3. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

2.5 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Dallas Specialty & Mfg. Co.
        2) Fernco Inc.
        3) Mission Rubber Company; a division of MCP Industries, Inc.
        4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

    b. Standard: ASTM C 1173.
    c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

    a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    b. NPS 2 and Larger: Pressure transition couplings.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.

F. Install supports for vertical cast-iron soil piping every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves, cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Aboveground, soil and waste piping [NPS 5 and larger shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

E. Aboveground, vent piping NPS 5 and larger shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.

G. Underground, soil and waste piping NPS 5 and larger shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.

H. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

END OF SECTION 221316

SECTION 221319 SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof flashing assemblies.
5. Through-penetration firestop assemblies.
6. Miscellaneous sanitary drainage piping specialties.
7. Flashing materials.
8. FOG disposal systems.
9. Grease interceptors.
10. Solids interceptors.

B. Related Requirements:

1. Section 221423 "Storm Drainage Piping Specialties" for storm drainage piping inside the building, drainage piping specialties, and drains.
2. Section 224300 "Medical Plumbing Fixtures" for plaster sink interceptors.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Grease interceptors.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate size and location of roof penetrations.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Plumbing Products Group or comparable product by one of the following:

1) Josam Company.
2) MIFAB, Inc.
3) Smith, Jay R. Mfg. Co.
4) Tyler Pipe.
5) Watts Drainage Products.
6) Or approved equal

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch, or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Plumbing Products Group; Z1400B or comparable product by one of the following:

1) Josam Company.
2) MIFAB, Inc.
3) Smith, Jay R. Mfg. Co.
4) Tyler Pipe; Wade Div.
5) Or approved equal

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Spigot.
7. Closure: Brass plug with straight threads and gasket.
8. Adjustable Housing Material: Cast iron.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Medium Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Plumbing Products Group; Specification Drainage Operation; Z1441 or Z1443 or comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products.
    f. Or approved equal

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Plumbing Products Group**;** Specification Drainage Operation or comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products.
    f. Or approved equal

2. Standard: ASME A112.6.3.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Outlet: Bottom.
6. Top or Strainer Material: Nickel bronze.
7. Top Shape: Round.
8. Trap Material: Cast iron.
9. Trap Pattern: Deep-seal P-trap.
10. Trap Features: Trap-seal primer valve drain connection.

B. Wall Box:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Durgo, Inc.
    b. Oatey.
    c. RectorSeal.
    d. Studor, Inc.
    e. Or approved equal

2. Description: White plastic housing with white plastic grille, made for recessed installation.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.
    c. Or approved equal

2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

    a. Open-Top Vent Cap: Without cap.
    b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
    c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ProSet Systems Inc.
    b. Hilti.
    c. Or approved equal

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.

4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2 inch to 4-inch-minimum water seal.

    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 GREASE INTERCEPTORS

A. Grease Interceptors:

1. Cast-Iron or Steel Grease Interceptors:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Josam; 60117A or comparable product by one of the following:

1) Zurn.
2) MIFAB, Inc.
3) Rockford Sanitary Systems, Inc.
4) Schier Products Company.
5) Smith, Jay R. Mfg. Co.
6) Tyler Pipe; Wade Div..
7) Watts Drainage Products.
8) Or approved equal

2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food preparation wastewater.
3. Plumbing and Drainage Institute Seal: Required.
4. Body Material: Cast iron or steel.
5. Interior Lining: Corrosion-resistant epoxy.
6. Exterior Coating: Corrosion-resistant epoxy.
7. End Connections: Threaded.
8. Mounting: Above floor.
9. Flow-Control Fitting: Required.
10. Operation: Manual cleaning.

2.8 SOLIDS INTERCEPTORS

A. Solids Interceptors:

1. Cast-Iron or Steel Solids Interceptors:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R Smith; Fig. 8714 or comparable product by one of the following:

1) Josam Company.
2) MIFAB, Inc.
3) Zurn Plumbing Products Group.

4) Schier Products Company.
5) Smith, Jay R. Mfg. Co.
6) Tyler Pipe; Wade Div.
7) Watts Drainage Products.
8) Or approved equal

2.9 MOTORS

A. General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

P. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

Q. Install grease removal devices on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction. Install control panel adjacent to unit, unless otherwise indicated.

R. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

S. Install wood-blocking reinforcement for wall-mounting-type specialties.

T. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit and connect flow-control fitting and vent to unit inlet piping.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Grease interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221319.13 SANITARY DRAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor drains.
2. Floor sinks.
3. Trench drains.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene.

D. PE: Polyethylene.

E. PP: Polypropylene.

F. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. MIFAB, Inc.
    d. WATTS.
    e. Zurn Industries, LLC.
    f. Or approved equal

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Backwater Valve: Integral, ASME A112.14.1, swing-check type.
10. Coating on Interior and Exposed Exterior Surfaces
11. Top or Strainer Material: Nickel bronze.
12. Top of Body and Strainer Finish: Nickel bronze.
13. Top Shape: Round.
14. Top Loading Classification: Medium Duty.
15. Trap Material: Cast iron.
16. Trap Pattern: Deep-seal P-trap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

    a. Maintain integrity of waterproof membranes where penetrated.

5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Comply with requirements in Section 221323 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.

D. Install piping adjacent to equipment to allow service and maintenance.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319.13

SECTION 221413 FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which drainage piping will be attached or suspended from.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of McWane family of companies.
5. Or approved equal

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Class: ASTM A74, Service class.

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of McWane family of companies.
5. Or approved equal

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Dallas Specialty & Mfg. Co.
d. Fernco Inc.
e. Ideal Clamp Products, Inc.
f. Matco-Norca.
g. MIFAB, Inc.
h. Mission Rubber Company, LLC; a division of MCP Industries.
i. NewAge Casting.

j. Tyler Pipe; a subsidiary of McWane Inc.
k. Or approved equal

2. Couplings shall bear CISPI collective trademark.
3. Standards: ASTM C1277 and CISPI 310.
4. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Clamp-All Corp.
d. Dallas Specialty & Mfg. Co.
e. Ideal Clamp Products, Inc.
f. MIFAB, Inc.
g. Mission Rubber Company, LLC; a division of MCP Industries.
h. NewAge Casting.
i. Tyler Pipe; a subsidiary of McWane Inc.
j. Or approved equal

2. Standard: ASTM C1540.
3. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

K. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

L. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.

M. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

a. Test storm drainage piping**,** except outside leaders**,** on completion of roughing-in.
b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 4 to NPS 10 shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.

C. Underground storm drainage piping NPS 4 to NPS 10 shall be the following:

1. Push-Fit, 316L Stainless steel pipe and fittings; gaskets; and gasketed joints.

2. Service class, cast-iron soil pipe and fittings; lead and oakum joints.

END OF SECTION 221413

SECTION 221423 STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for penetrations of roofs.
2. Section 078413 "Penetration Firestopping" for firestopping roof penetrations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Combination Roof Drain and Secondary Overflow Drain:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Z163 Series or a comparable product by one of the following:

a. MIFAB, Inc.
b. Wade; a subsidiary of McWane Inc.
c. Watts.

2. Description: Combination roof drain and overflow roof drain with epoxy coated cast iron drain bodies, flashing clamps with integral gravel guards, 2-inch high internal standpipe, self-locking polyethylene domes (standard), and no hub (standard) outlets.
3. Standard: ASME A112.6.4.
4. Body Material: Cast iron.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Outlet Type: No hub.
8. Sump Receiver Plate: Required.
9. Dome Material: Poly.
10. Overflow with Internal Standpipe: 2 inches high.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Boots:

1. Basis-of-Design Product: Subject to compliance with requirements, provide WATTS; RD-970 or a comparable product by one of the following:

    a. J.R. Hoe & Sons Inc.
    b. Neenah Foundry Company.
    c. Zurn.

2. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
3. Size: Inlet size to match downspout and NPS 4 outlet.

B. Downspout Nozzles:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Z199-DC or a comparable product by one of the following:

    a. MIFAB, Inc.
    b. Wade; a subsidiary of McWane Inc.
    c. Watts

2. Description: Cast-nickel-bronze downspout nozzle with anchor flange, countersunk mounting holes, and IPS threaded (standard), no hub, or push-on connection.
3. Outlet Type: No hub.
4. Size: Same as connected conductor.

2.3 CLEANOUTS

A. Cast-Iron Exposed Floor Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Z1400 Series or a comparable product by one of the following:

a. Josam Company.
b. Oatey.
c. Watts.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body Material: Epoxy-coated cast iron.
6. Closure: Plastic plug.
7. Adjustable Housing Material: Cast iron with threads.
8. Frame and Cover Material and Finish: Painted cast iron.
9. Frame and Cover Shape: Round.
10. Top Loading Classification: Extra-Heavy Duty.
11. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
12. Access Housing, CO-300-MF: Epoxy coated cast-iron access housing with two fixed anchor flanges, and extra-heavy-duty ductile iron (standard) access cover.
13. Isolation Cleanout, CO-600-R: Neoprene movement compensator coupling.

B. Cast-Iron Wall Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Z1446 or a comparable product by one of the following:

a. MIFAB, Inc.
b. Wade; a subsidiary of McWane Inc.
c. Watts.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: No hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

a. ABS.
b. Raised head.
c. Drilled and threaded for cover attachment screw.
d. Size: Same as, or not more than, one size smaller than cleanout size.

6. Wall Access: Round, flat, stainless-steel cover plate with screw.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 6 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

F. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

G. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

H. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

I. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 224213.13 COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall-mounted water closets.
2. Flushometer valves and tanks.
3. Toilet seats.
4. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

A. Water Closets, Wall Mounted, Top Spud:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. American Standard.
    b. Crane Plumbing, L.L.C.
    c. Kohler Co.
    d. TOTO USA, INC.
    e. Zurn Industries, LLC.
    f. Or approved equal

2. Bowl:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.

c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.

2.2 FLUSHOMETER VALVES

A. Battery Operated Sensor Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kohler.
    b. Sloan Valve Company.
    c. Zurn Industries, LLC.
    d. Or approved equal

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Consumption: 1.28 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bemis Manufacturing Company.
    b. Kohler Co.
    c. Olsonite Seat Co.
    d. Or approved equal

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.

8. Seat Cover: Not required.
9. Color: White.

2.4 SUPPORTS

A. Water Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jay R Smith.
   b. Josam Company.
   c. Zurn Industries, LLC.
   d. Or approved equal

2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.2 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.3 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224216.13 COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vitreous-china, counter-mounted lavatories.
2. Automatically operated lavatory faucets.
3. Supply fittings.
4. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory - Vitreous China, Undercounter Mounted:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Kohler Co.
c. TOTO USA, INC.
d. Or approved equal

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: Self-rimming for above-counter mounting.
c. Nominal Size:

1) Rectangular, 17 by 13 inches.

d. Color: White.
e. Mounting Material: Sealant.

2.2 AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI) accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets - Automatic Type: Hardwired Electronic Sensor Operated, Mixing,:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kohler Co.
b. Sloan Valve Company.
c. T&S Brass and Bronze Works, Inc.
d. Or approved equal

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.
8. Mounting Type: Deck, concealed.
9. Spout: Rigid type.
10. Spout Outlet: Aerator.
11. Drain: Not part of faucet.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless steel, flexible hose riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/4.
2. Material:

a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
b. Stainless steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless steel tube to wall; and stainless steel wall flange.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lavatories level and plumb in accordance with roughing-in drawings.

B. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

C. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.2 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 230500 COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Equipment installation requirements common to equipment sections.
6. Painting and finishing.
7. Concrete bases.
8. Supports and anchorages.
9. Specific requirements for conducting work required by this contract.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equivalent.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

PART 3 - EXECUTION

3.1 COMPLIANCE WITH CODES, STANDARDS AND REGULATIONS

A. In addition to general instructions contained in the General or Project Requirements, equipment and its installation shall conform to the following applicable codes, standards and regulations, latest editions:

1. American Society for Testing and Materials (ASTM).
2. American Society of Mechanical Engineers (ASME).
3. American National Standard Institute (ANSI).
4. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
5. American Refrigeration Institute (ARI).
6. American Welding Society Code (AWSC).
7. Code for Pressure Piping (ANSI B 31.1).
8. International Building Code – New Jersey Edition (IBC).
9. International Mechanical Code – New Jersey Edition (IMC.)
10. National Electrical Code (NEC).
11. National Fire Protection Association (NFPA).
12. National and Local Building, Plumbing and Mechanical Codes.
13. Occupational Safety & Health Act (OSHA).
14. Sheet Metal & Air Conditioning Contractors National Association (SMACNA).
15. Underwriters' Laboratories, Inc. (UL).

16. Air Moving and Conditioning Association, Inc. (AMCA).
17. Associated Air Balance Council (AABC).
18. National Environmental Balancing Bureau (NEBB).
19. Building Officials and Code Administrators (BOCA).
20. Hydraulic Institute (HI).
21. Manufacturer's Standardization Society (MSS).
22. Cooling Tower Institute (CTI).
23. Environmental Protection Agencies - Federal, State and Local (EPA).

3.2 STANDARD OF QUALITY

A. The specifications establish the standards of quality required, either by description or by references to brand name, name of manufacturers or manufacturer's model number.

B. Where one product only is specifically identified by name or manufacturer's model number, the Contractor shall base his bid on the use of the named product. Where multiple names are used, the Contractor shall base his bid on the use of any of those products named. The Contractor is advised that the scheduled manufacturer on the contract drawings and/or the first manufacturer listed in the specifications is the manufacturer whose equipment was used as the Basis of Design. As such the other manufacturer’s listed may have variances requiring additional coordination and revisions to the product of other trades. The Contractor bears full responsibility for the cost of any changes incurred by using equipment other than the Basis of Design noted equipment.

C. When equipment and/or materials are proposed to be purchased from a manufacturer other than those specified, the Contractor shall provide data sufficient to inform the Engineer of the basis of equality of the substitution to that of the equipment and/or materials specified.

D. When equipment other than that specified is used, the Contractor shall be responsible for any extra cost of required revisions such as structural steel, concrete, electrical, piping, ductwork and any engineering review or redesign, etc. Such additional cost shall be identified at the time such substitutions are proposed.

E. Contractor is responsible for the installation of all systems and equipment in strict accordance with the equipment or systems manufacturer’s recommendations and/or requirements. In the event that the contract documents are not in accordance with the manufacturer’s recommendations, the Contractor must notify the Engineer of the discrepancy, prior to proceeding with the installation of the equipment.

3.3 PROTECTION OF WORK

A. Contractor is responsible for the protection of his materials, equipment and completed work as defined in the General or Project Requirements and as supplemented herein.

B. All openings into any part of the piping and duct systems, all fixtures and equipment must be securely covered or otherwise protected to prevent damage due to dropped tools or materials, work by others or intrusion of grit, dirt or other foreign matter. The Contractor shall be held responsible for all damage done to unprotected work or materials.

C. All equipment on site, whether stored or installed, shall be protected with weather tight covers.

3.4 MOVING OF EQUIPMENT

A. Verify that mechanical equipment will pass through all restricting openings, and when equipment or sections of equipment are larger than these openings, install this equipment prior to construction of enclosing walls, floors or roofs.

B. Use planking or cribbing as required to protect adjoining existing construction or new construction from damage.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to “Firestopping” specification for additional requirements.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.6 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

3.7 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.8 CUTTING, PATCHING AND PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Provide all openings through walls, floors and ceilings, etc. required for the installation of work defined on the Contract Drawings and Specifications.

C. Following installation and testing, restore floors, walls and ceilings with materials equivalent to the original construction and finish to match existing surfaces. All existing fire ratings shall be maintained without exception.

D. Cutting and patching shall be performed only by tradesmen familiar with the construction involved.

3.9 FLASHING

A. Where ducts, pipes or other items pass through any roof, wall or other exterior component, provide flashing as detailed on Contract Drawings. At a minimum, for roofing penetrations, contractor shall finalize all penetrations in accordance with roofing system manufacturer’s requirements (whether warranty is valid or invalid). If roof warranty is intact, contractor shall notify roofing manufacturer prior to commencing work to insure all warranties will be maintained post work completion.

3.10 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Miscellaneous Cast-in-Place Concrete."

3.11 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Structural Steel Framing" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment. Provide all miscellaneous steel supports and anchors required for equipment and materials installed under this Specification. Manual of Construction by American Institute of Steel Construction latest edition shall be followed in design and construction except paragraph 4.2.1 and 4.2.2, Section 4 of Division 5, page 5-177 will not apply. Structural steel members shall conform to ASTM A36, and shall have a shop applied coat of rust inhibitive paint.

C. Field Welding: Comply with AWS D1.1.

D. Bolts, nuts and washer shall be high tensile type minimum 3/4" diameter conforming to ASTM A325.

END OF SECTION 230500

SECTION 230513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

END OF SECTION 230513

SECTION 230517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079220 "Interior Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller than NPS 6 Cast-iron wall sleeves.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller than NPS 6 Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller than NPS 6 Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

   a. Piping Smaller than NPS 6 Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

SECTION 230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are

licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 –VIBRATION ISOLATION AND WIND LOAD RESTRAINTS FOR HVAC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections apply to this Section

B. This section specifies required vibration control for all equipment, where applicable, with the wind load requirements for all equipment in outdoor locations. Additionally, included are provisions for flood control as stated herein. When projects are located in a geographically active wind or flood location, Section 1.4, General Design and Performance Requirements, will elaborate on those requirements and include specifics pertaining to a facility's "continued operation." Para. 1.2, Section D is a partial list of components covered herein. This specification is part of the general conditions for the HVAC contract.

1.2 SUMMARY

A. This section includes the following:

1. All equipment, piping, ductwork and conduit as noted on the drawing's schedule or in the specification shall be seismically braced if the building is so classified as listed herein. Vibration control shall apply as described in all cases herein.

2. All outdoor equipment, including roof-mounted components, shall comply with section 1609, Wind Load, IBC-2018. There shall be no decrease of the effects of wind load on a component due to other structures or components acting as blocks or screens.

3. All below, at grade or above grade locations located in a flood hazard area as defined and located herein.

4. Wind, flood load and isolation materials shall be the certified products of the same manufacturing group and shall be certified by that group.

5. It is the intent of the wind load portion of this specification to keep all mechanical building system components in place during a seismic or high wind event and additionally operational where the occupancy category of the building so requires as listed herein.

6. All such systems must be installed in strict accordance with wind codes, component manufacturer's and building construction standards.

7. This specification is considered to be minimum requirements for wind, flood and vibration control considerations.

8. Any variation, which results in non-compliance with the specification requirements, shall be corrected by the contractor in an approved manner.

B. The work in this section includes, but is not limited to, the following:

1. Vibration isolation for piping, ductwork, bus duct, cable tray conduit and equipment, all referred to as components.

2. Component isolation bases.

3. Wind restraints for isolated components.

4. Wind restraints for non-isolated components.

5. Certification of wind restraint designs.

6. Installation supervision.

7. Design of attachment of housekeeping pads.

8. All components requiring IBC compliance and certification.

9. All inspection and test procedures for components requiring IBC compliance.

C. All mechanical equipment, pipe and ductwork, within, on or outdoors of the building and entry of services to the building, up to but not including, the utility connection, is part of this Specification.

D. Components referred to below are typical. (Components not listed are still included in this specification.) All systems that are part of the building in any way are referred to as components, including:

- AC Units
- Adapter Curb
- Air Handling Units
- Air Separators
- Boilers
- Cabinet Unit Heaters
- Chillers
- Compressor
- Computer Room Units
- Condensing Units
- Cooling Towers
- Curbs
- Dry Coolers
- Ductwork
- Equipment Supports
- Fans (all types)
- Fan Coil Units
- Gas Detection Systems
- Heat Exchangers
- Humidifiers
- Pipe
- Pumps (all types)
- Risers
- Rooftop Units
- Supports
- Tanks (all types)
- Unit Heaters
- Unit Ventilators
- Variable Frequency Drives
- VAV Boxes
- Vibration Isolators
- Water Heaters

1.3 DEFINITIONS (BUILDING AND COMPONENTS, ALL CODES)

A. ESSENTIAL FACILITIES, (Occupancy Category, IBC-2018)

1. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes.

B. General

1. Anchor: A device, such as an expansion bolt, for connecting equipment bracing members to the structure of a building.

2. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing analytical or inspection services, when such agency has been approved.

3. Attachment: See Positive Attachment below.

4. Basic Wind Speed: The basic wind speed, in mph, for determination of the wind loads shall be as per Section 1609 (IBC-2018), or local code, if more severe. Local jurisdictions shall determine wind speeds for indicated special wind regions located near gorges or mountainous terrain. Section 6.5.4 of ASCE 7-05 shall be used after determination of basic wind speed by the local jurisdiction. See Section 1609.3 ASCE 7-05 for basic wind speed determination in non-hurricane prone regions.

5. Bracing: Metal channels, cables or hanger angles that prevent components from breaking away from the structure during an earthquake or high winds. See also Longitudinal Bracing and Transverse Bracing. Together, they resist environmental loads from any direction.

6. Certificate of Compliance: A certificate stating that materials and products meet specified standards or that work was done in compliance with approved construction documents, provided by an approved agency. (Certificate to be supplied by equipment component manufacturer.)

7. Component: A non-structural part or element of an architectural, electrical, mechanical, plumbing or fire protection system within or without of a building system.

8. Component Importance Factor: Factor applied to a component that defines the criticality of that component. This factor can be 1.0 or 1.5.

9. Component, flexible: Component, including its attachments, having a fundamental period greater than 0.06 seconds.

10. Component, rigid: Component, including its attachments, having a fundamental period less than or equal to 0.06 seconds.

11. Consequential Damage: The functional and physical interrelationship of components, their supports and their effect on each other shall be considered so that the failure of an essential or non-essential architectural, mechanical or electrical component shall not cause the failure of an essential architectural, mechanical or electrical component.

12. Equipment: Systems associated with ducts, pipes and conduits also called components.

13. Flood or Flooding: A general and temporary condition or partial and complete inundation of normally dry land from:

    a. The overflow of inland or tidal waters.
    b. The unusual and rapid accumulation of runoff of surface waters from any source.

14. Flood Hazard Area: The greater of the following of two areas:

    a. The area within a flood plain subject to a 1 percent or greater chance of flooding in any year.
    b. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

15. Special Flood Hazard Area Subject to High Velocity Wave Action: Area within the flood hazard area that is subject to high velocity wave action and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as zone V, VO, VE or VI-30.

16. Flood Insurance Rate Map (FIRM): An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the special flood hazard areas and the risk premium zones applicable to the community.

17. Gas pipes: For the purposes of this Specification Guide, gas pipe is any pipe that carries fuel, gas, fuel oil, medical gas, or compressed air.

18. Hazardous Contents: A material that is highly toxic or potentially explosive or corrosive and in sufficient quantity to pose a significant life-safety threat to the general public if an uncontrolled release were to occur.

19. Hurricane Prone Regions: Areas prone to hurricanes include the U.S. Atlantic Ocean, Gulf Coasts, Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa where the wind speed is greater than 90 mph.

20. Importance Factor, I: A factor that accounts for the degree of hazard to human life and damage to property.

21. Inspection Certificate: An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of an approved agency that indicates that the product or material has been inspected and evaluated by an approved agency (see Section 1703.5 and "Label" and "Manufacturer's Designation" and "Mark").

22. Label: An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics, and the name and identification of an approved agency that indicates that the representative sample of the product or material has been tested and evaluated by an approved agency (see Section 1703.5 and "Inspection Certificate," "Manufacturer's Designation" and "Mark").

23. Lateral forces: A force acting on a component in the horizontal plane. This force can be in any direction.

24. Longitudinal bracing: Bracing that prevents a component from moving in the direction of its run.

25. Longitudinal force: An applied force that happens to be in the same direction as the duct or pipe run.

26. Mark: An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material (see also "Inspection Certificate," "Label" and "Manufacturer's Designation").

27. Manufacturer's Designation: An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules (see also "Inspection Certificate," "Label" and "Mark".)

28. Occupancy Category: A classification used to determine structural load requirements including those imposed by wind, flood, snow and seismic based on occupancy of the structure.

29. Positive Attachment: A mechanical device, designed to resist seismic forces, which connects a non-structural element, such as a duct, to a structural element, such as a beam. Bolts and welding are examples of positive attachments. Surface glue and friction anchorage do not constitute positive attachment. Examples of positive attachment are epoxy cast in anchors and drill in wedge shaped anchor bolts to concrete and welded or bolted connections directly to the building

structure. Double-sided beam clamps, C type are not acceptable as either brace point attachments to the structure or for the support of the component at the bracing location.

30. Site Class: A classification assigned to a site based on the types of soils present and their engineering properties as defined in Table 1613.5.2 (IBC-2018).

31. Special Inspection: Inspection as herein required of the materials, installation, fabrication, erection or placement of components and connections requiring special documents and referenced standards (see Section 1704, IBC-2018).

32. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

33. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

34. Story Drift Ratio: The story drift (Lateral displacement) divided by the story height.

35. Wind-Borne Debris Region: Portions of hurricane-prone regions that are within 1 mile of the coastal mean high water line where the basic wind speed is 110 mph or greater, or portions of hurricane-prone regions where the basic wind speed is 120 mph or greater; or Hawaii.

1.4 GENERAL DESIGN AND PERFORMANCE REQUIREMENTS

A. General Design Requirements.

1. SEISMIC AND WIND CONSIDERATIONS: This project has seismic and wind design requirements as follows:

a. Per table provided by the Structural Engineer on S-200:

LATERAL LOAD DESIGN SCHEDULE INTERNATIONAL BUILDING CODE 2018/ASCE 7-16			
WIND LOAD			
ITEM	SYMBOL	VALUE	REFERENCE
BASIC WIND SPEED (3 SEC. GUST)	V	114	FIGURE 1609.3
RISK CATEGORY	-	II	TABLE 1.5-1
WIND EXPOSURE CATEGORY	-	B	SECTION 1609.4.3
SEISMIC LOAD			
ITEM	SYMBOL	VALUE	REFERENCE
IMPORTANCE FACTOR	I_E	1.0	TABLE 1.5-2
SHORT PERIOD SPECTRAL ACCELERATION	S_{DS}	0.245	SECTION 1613.2.4
(1) SECOND PERIOD SPECTRAL ACCELERATION	S_{D1}	0.059	SECTION 1613.2.4
RISK CATEGORY	-	II	TABLE 1604.5
SEISMIC DESIGN CATEGORY	-	B	SECTION 11.6
SITE CLASSIFICATION	-	C	TABLE 20.3-1
SEISMIC FORCE-RESISTING SYSTEM	-	INTERMEDIATE P/C CONCRETE SHEAR WALL	TABLE 12.2-1
RESPONSE MODIFICATION COEFFICIENT	R	4	TABLE 12.2-1
DEFLECTION AMPLIFICATION FACTOR	C_d	4	TABLE 12.2-1
SEISMIC BASE SHEAR	V	-	SECTION 12.8.1
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE		SECTION 12.8

2. FLOOD CONSIDERATIONS: This project has design requirements in accordance with FEMA and/or FIRM as follows:

   a. NONE.

B. General Design Performance Requirements

1. Design Wind Loads:

   a. All outdoor mounted components shall be positively fastened to their supporting structure as discussed below. Fastening to metal deck is unacceptable.
      1) If component is curb mounted, article 7, Design Seismic Loads, paragraph g shall be followed for all roof-mounted components in excess of 9 sq. ft. in cross-sectional area. Curbs shall be as described in Base type B-3 if isolated, Base type B-4 if non-isolated.
      2) If component is support mounted, article 7, Design Seismic Loads, paragraph g shall be followed for all roof-mounted components requiring waterproofed rail supports. Equipment supports shall be Base type B-5 if isolated, Base type B-6 if non-isolated.
      3) If equipment is dunnage mounted, positive attachment shall occur through welding or bolting of equipment to dunnage steel.

b. Loads and calculations shall be based on IBC-2018, figure 1609 and related sections in ASCE 7-05.
c. Where buildings are less than or equal to 60 feet in height to the top of the roof slab (not parapet walls), the force on roof-mounted components shall be based on Section 6.5.15.1, ASCE 7-05.
d. Equivalent basic wind speed shall be based on IBC-2018, Table 1609.3.1.
e. In no event shall adjacent buildings, structures or screens be considered to diminish the calculated wind load or its effect on an outdoor component.

1.5 SUBMITTALS

A. Refer to Part 1, General.

B. Product Data: The manufacturer of vibration isolation, seismic, wind and flood restraints shall provide submittals for products as follows:

1. Descriptive Data:

a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and restraints by referencing numbered descriptive drawings.

2. Shop Drawings:

a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
b. Provide all details of suspension and support for ceiling hung equipment.
c. Provide specific details of restraints and anchors, include number, size and locations for each piece of equipment. Restraint and anchor allowables shall be by structural testing, shake testing, analysis or third party certification.
d. Calculations shall be submitted as required in Section 1.4, General Design and Performance Requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer of vibration isolation and wind load control equipment or manufacturer’s approved representative shall have the following responsibilities:

1. Determine vibration isolation and restraint sizes and locations.

2. Provide vibration isolation and restraints as scheduled or specified.

3. Provide calculations and materials, if required, for restraint of non-isolated equipment.

4. Provide installation instructions in writing, drawings and trained field supervision, where necessary, to insure proper installation and performance.

5. Certify correctness of installation upon completion, in writing.

6. All provisions of Section 1.4, General Design and Performance Requirements.

B. All manufacturers of vibration control, wind or flood restraining systems must provide a Design Error and Omissions Insurance Certificate for their firm or their design consultant to certify their ability to provide engineering and design as required by this section. This document shall be provided at the time of first submittal from the restraint provider.

C. All manufacturers of any type of equipment including OEM are responsible for Section 1.4.

D. Equipment manufacturer's substitution of internally or externally isolated and/or restrained equipment supplied by the equipment vendor, in lieu of the isolation and restraints specified in this section, is acceptable provided all conditions of this section are met.

E. All costs for converting to the specified vibration isolation and/or restraints shall be borne by the component vendor in the event of non-compliance with the preceding. Substitution of internal isolation is unacceptable.

1.7 RELATED WORK

A. Housekeeping pad structural design, including its attachment to building structure, shall be by the structural engineer of record or as shown on the contract drawings. Attachment of all components and restraints to the pad and size of the pad shall be designed and certified according to this section by the seismic/isolation supplier. Material and labor required for attachment and construction shall be by the concrete section contractor, or by the contractor where specified. Housekeeping pads shall be sized to accommodate a minimum 6" of clearance all around the equipment; or 12 times the outermost anchor bolt diameter, whichever is greater. Where exterior isolators are used, this distance shall be as measured from the outermost holes in the isolator base plate to the edge of the housekeeping pad.

B. The project's structural engineer shall design all roof and interior steel to support and make connections to all components, including roof-mounted equipment specified in other sections. Design shall comply with IBC requirements including load path to structure.

C. Roof steel supporting roof-mounted equipment shall be designed for all wind forces including, but not limited to, tension, compression and moment loads.

D. Chimneys, stacks and boiler breeching passing through floors are to be attached at each floor level with a riser guide.

1.8 CODE AND STANDARDS REQUIREMENTS

A. Typical Applicable Codes and Standards

1. All City, State and Local Codes (Code)

    a. American Society For Testing and Materials (ASTM) (Standard)
    b. International Conference of Building Officials (ICBO) (Standard)
    c. International Building Code (Code)
    d. ASHRAE (Standard reference, to be used for design purposes only, not code).
    e. VISCMA (Vibration Isolation and Seismic Controls Manufacturers Association) (Standard reference, to be used for design purposes only, not code).

B. In cases where requirements vary, the guideline for the most stringent shall be utilized.

C. International Fire Code

D. Use IBC-2018 as reference code standard unless otherwise designated.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. All vibration isolators and seismic restraints described in this Section shall be the product of a single manufacturer. The basis of this specification is The VMC Group, including Vibration Mountings & Controls, Amber/Booth, Korfund Dynamics or approved equal. Products from other nationally recognized manufacturers are acceptable provided their systems strictly comply with these specifications and have the approval of the specifying engineer. Manufacturer shall be a regular member of VISCMA (Vibration Isolation and Seismic Controls Manufacturers Association). See Form VL-1 listing other manufacturers to be considered for use on this project.

2.2 VIBRATION ISOLATION TYPES

A. Type A: Spring Isolator – Free Standing,
A*

1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded elastomeric cup or ¼" elastomeric acoustical friction pad between the bottom of isolator and the support.

2. All mountings shall have leveling bolts that must be rigidly bolted to the equipment.

3. Spring diameters shall be no less than 0.8" of the compressed height of the spring at rated load.

4. Springs shall have a minimum additional travel to solid equal to 50% of the operating deflection.

B. Type B: Wind Restrained Spring Isolator
MS, MSS, AEQM, ASCM, AMSR

1. Restrained spring mountings shall have a Type A spring isolator within a rigid housing that includes vertical limit stops to prevent spring extension if weight is removed. The housing shall serve as blocking during erection. A maximum clearance of ¼" shall be maintained around restraining bolts and internal elastomeric deceleration bushings. Limit stops shall be out of contact during normal operation. If housings are to be bolted or welded in position there must be an internal isolation pad or elastomeric cup. Housing shall be designed to resist all seismic forces.

C. Type C: Combination Spring/Elastomer Hanger Isolator (30° Type)
HRSA

1. Hangers shall consist of rigid steel frames containing minimum 1 ¼" thick elastomeric elements at the top and a steel spring with general characteristics as in Type A. The elastomeric element shall have resilient bushings projecting through the steel box.

2. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the rod bushing and short-circuiting the spring.

3. Submittals shall include a hanger drawing showing the 30° capability.

4. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed or pre-positioning for all manufacturers.

D. Type D: Elastomer Double Deflection Hanger Isolator
HR

1. Molded (minimum 1 ¼" thick) elastomeric element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35."

2. Steel retainer box encasing elastomeric mounting capable of supporting equipment up to two times the rated capacity of the element.

E. Type E: Combination Spring/Elastomer Hanger Isolator
HRS

1. Spring and elastomeric elements in a steel retainer box with the features as described for Type C and D isolators.

2. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed or pre-positioning for all manufacturers.

3. 30° angularity feature is not required.

F. Type F: Wind Restrained Elastomer Floor Isolator
RSM, MB, RUD

1. Bridge-bearing elastomeric mountings shall have a minimum static deflection of 0.2" and all-directional seismic capability. The mount shall consist of a ductile iron or aluminum casting containing molded elastomeric elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock-absorbing elastomeric materials shall be compounded to bridge-bearing or DuruleneTM specifications.

G. Type G: Pad Type Elastomer Isolator (Standard)
Maxiflex

1. One layer of ¾" thick elastomeric pad consisting of 2" square modules for size required.

2. Load distribution plates shall be used as required.

3. Bolting required for seismic compliance. Elastomeric and duck washers and bushings shall be provided to prevent short-circuiting.

H. Type H: Pad Type Elastomer Isolator (High Density)
Fabri-Flex, NDB, NRC

1. Laminated canvas duck and neoprene, maximum loading 1000 psi, minimum ½" thick.

2. Load distribution plate shall be used as required.

3. Bolting required for seismic compliance. Elastomeric and duck washers and bushings shall be provided to prevent short-circuiting.

I. Type I: Thrust Restraints
RSHTR, TRK

1. A spring element similar to Type A isolator shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting movement of air handling equipment to ¼" due to thrust forces. Contractor shall supply hardware.

2. Thrust restraints shall be installed on all cabinet fan heads, axial or centrifugal fans whose thrust exceeds 10% of unit weight.

J. Type J: Pipe Anchors
MDPA, AG

1. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing or piping separated by a minimum ½" thick 60 durometer elastomer.

2. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction.

3. Applied loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

K. Type K: Pipe Guides
PG/AG/SWP/SWX

1. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing or piping separated by a minimum ½" thickness of 60 durometer elastomer.

2. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and replaceable to allow for selection of pipe movement.

3. Guides shall be capable of ± 1 5/8" motion, or to meet location requirements.

L. Type L: Isolated Pipe Hanger System
CIH, CIR, TIH, PIH

1. Pre-compressed spring and elastomer isolation hanger combined with pipe support into one assembly. Replaces standard clevis, single or double rod roller, or double rod fixed support.

2. Spring element (same as Type A) with steel lower spring retainer and an upper elastomer retainer cup with an integral bushing to insulate support rod from the isolation hanger.

3. The elastomeric element under the lower steel spring retainer shall have an integral bushing to insulate the support rod from the steel spring retainer.

4. Hangers shall be designed and constructed to support loads over three times the rated load without failure.

5. Systems shall be pre-compressed to allow for rod insertion and standard leveling.

2.3 WIND RESTRAINT TYPES

A. Type I: Spring Isolator, Restrained
MS, MSS, AEQM, ASCM, AMRS

1. Refer to vibration isolation Type B.

B. Type II: Wind Restrained Elastomer Floor Isolator
MB, RUD

1. Refer to vibration isolation Type F.

C. Type III: All-Directional Wind Snubber
SR, ER

1. All-directional snubbers shall consist of interlocking steel members restrained by an elastomeric bushing. Bushing shall be replaceable and a minimum of ¼" thick. Applied loading shall not exceed 1000 psi. A minimum air gap of 1/8" shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Elastomeric bushings shall be rotated to insure no short circuits exist before systems are activated.

D. Type IV: Floor or Roof Anchorage
Cast-In Plates

1. Rigid attachment to structure utilizing wedge type anchor bolts, anchored plates, machine screw, bolting or welding. Power shots are unacceptable.

2.4 EQUIPMENT BASES

A. General

1. All curbs and roof rails are to be bolted or welded to the building steel or anchored to the concrete deck (minimum thickness shall be 4") for resisting wind and seismic forces in accordance with the project location. (Fastening to metal deck is unacceptable.)

B. Base Types

1. Type B-1: Integral Structural Steel Base
WFB, SFB, WSB

a. Rectangular bases are preferred for all equipment.
b. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case and end suction pumps shall include supports for suction and discharge elbows.
c. All perimeter members shall be structural steel beams with a minimum depth equal to 1/12 of the longest dimension between isolators.
d. Base depth need not exceed 12" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
e. Height saving brackets shall be employed in all mounting locations to provide a minimum base clearance of 2."

2. Type B-2: Concrete Inertia Base
MPF, WPF, CPF

a. Vibration isolation manufacturer shall furnish rectangular welded or bolted modular steel concrete pouring forms for floating and inertia foundations.

b. Bases for split case and end suction pumps shall be large enough to provide for suction and discharge elbows.
c. Bases shall be a minimum of 1/12 of the longest dimension between isolators but not less than 6."
d. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity.
e. Forms shall include a minimum concrete reinforcing consisting of 3/8" bars welded in place a maximum of 16" on centers running both ways in a layer 1 to 1½" above the bottom.
f. Forms shall be furnished with steel templates to hold the component anchor bolts sleeves and anchors while concrete is being poured.
g. Height saving brackets shall be employed in all mounting locations to maintain a 2" minimum operational clearance below the base.

3. Type B-3: Wind Load Isolation Curb
P6200, P6300

a. Option: Sound Package 1 & 2 VMC/AB-RPFMA/SRPFMA
1) Curb-mounted rooftop equipment shown on isolation schedule shall be mounted on structural wind restrained spring isolation curbs. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind load forces. The lower frame must accept point support for both wind load attachment and leveling. The upper frame must be designed with positive fastening provisions (welding or bolting), to anchor the rooftop unit to the curb, which will not violate the National Roofing Contractors Association (NRCA) ratings of the membrane waterproofing. Sheet metal screws are only acceptable if all provisions in Section 1.4, Article B, paragraph 7, Design Wind Loads, are met. Contact points between the rooftop unit, the curb and the building's structure shall show load path through those locations only.
2) All-directional elastomeric snubber bushings shall be minimum of ¼" thick. Steel springs shall be laterally stable and rest on ¼" thick elastomeric acoustical pads or cups.
3) Hardware must be plated and the springs shall be powder-coated or cadmium-plated.
4) The curb's waterproofing shall be designed to meet all NRCA requirements.
5) All spring locations shall have full spring view access ports with removable waterproof covers and all isolators shall be adjustable, removable and interchangeable.
6) Isolated curbs shall be supplied with a continuous air seal between the upper floating member and the stationary wood nailer.

4. Type B-4: Wind Load Non-Isolated Curbs
P6000

a. Option: Sound Package VMC-RPFMA/SRPFMA System

1) Wind load curbs shall have all provisions as Type B-3 curbs with the exception of spring isolation.
2) System shall be designed for positive anchorage or welding of equipment to supports and welding of supports to the building steel, capable of carrying the design wind loads.

5. Type B-5: Isolated Equipment Supports
R7200/R7300

a. Continuous structural equipment support rails that combine equipment support and isolation mounting into one unitized roof flashed assembly with all features as described for Type B-3.
b. System shall be designed for positive anchorage or welding of equipment to supports and welding of supports to the building steel, capable of carrying the design wind loads.

6. Type B-6: Non-Isolated Equipment Supports
R7000

a. This shall have the same provisions as Type B-5 without the spring isolation.

7. Type B-8 AHU / AC unit Structural Base Frames

a. Where roof mounted Air Conditioning or Air Handling Units are placed on steel platforms and are incapable of being point loaded or supported, structural frames shall be furnished which will either match the centerline dimensions of the unit's base frame rail or its curb dimensions. The structural frame shall have provisions to be welded or bolted to the unit's base frame and shall be supported on type "B" wind restrained isolation system.
b. Isolator deflection shall be either 1.5" or 2.5" depending on the tonnage of the roof mounted component as shown in Isolation Table "A". Structural Base Frame shall be type RTSBF as manufactured by The VMC Group.

2.5 FLEXIBLE CONNECTORS

A. Type FC-2: Flexible Stainless Steel Hose
SS-FP, SS-FW, SS-PM, SS-WE

1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples.

B. Type BC-2 connector shall be braided bronze for Freon connections.

1. Minimum lengths shall be as tabulated:

Flanged		Male Nipples	
3 x 14	10 x 26	½ x 9	1 ½ x 13
4 x 15	12 x 28	¾ x 10	2 x 14
5 x 19	14 x 30	1 x 11	2 ½ x 18
6 x 20	16 x 32	1 ¼ x 12	8 x 22

2. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. All areas that will receive components requiring vibration control or wind load bracing shall be thoroughly examined for deficiencies that will affect their installation or performance. Such deficiencies shall be corrected prior to the installation of any such system.

B. Examine all “rough ins” including anchors and reinforcing prior to placement.

3.2 APPLICATIONS

A. All vibration isolators and wind restraint systems must be installed in strict accordance with the manufacturer’s written instructions and all certified submittal data.

B. Installation of vibration isolators and wind restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system specified herein.

D. The contractor shall not install any isolated components in a manner that makes rigid connections with the building unless isolation is not specified. “Building” includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Overstressing of the building structure must not occur due to overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. General bracing may occur from flanges of structural beams, upper truss cords in bar joist construction and cast in place inserts or wedge type drill-in concrete anchors.

G. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted.

H. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraints shall be those described in the specification when horizontal motion exceeds 3/8.”

3.3 EQUIPMENT INSTALLATION

A. Equipment shall be isolated and/or restrained as per Tables A-E at the end of this section.

B. Place floor mounted equipment on 4” actual height concrete housekeeping pads properly sized and doweled or expansion shielded to the structural deck. Anchor isolators and/or bases to housekeeping pads. Concrete work is specified under that section of the contract documents.

C. Additional Requirements:

1. The minimum operating clearance under all isolated components bases shall be 2.”

2. All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment, isolators and restraints.

3. All components shall be installed on blocks to the operating height of the isolators. After the entire installation is complete and under full load including water, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. Remove all debris from beneath the equipment and verify that there are no short circuits of the isolation. The equipment shall be free to move in all directions, within the limits of the restraints.

4. All floor or wall-mounted equipment and tanks shall be restrained with Type V restraints.

3.4 PIPING AND DUCTWORK ISOLATION

A. Vibration Isolation of Piping:

1. HVAC Water Piping: All spring type isolation hangers shall be pre-compressed or pre-positioned if isolators are installed prior to fluid charge. If installed afterwards, field pre-compressed isolators can be used. All HVAC piping in the machine room shall be isolated. Heat exchangers and expansion tanks are considered part of the piping run. The first 3 isolators from the isolated equipment shall have at least the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces, the first 3 hangers shall have 0.75" nominal deflection or greater for pipe sizes up to and including 3," 1 3/8" nominal deflection or greater for pipe sizes greater than 3." Where column spacing exceeds 35', isolation hanger deflection shall be 2½" for pipes exceeding 3" diameter. Type L hangers may be substituted for the above where isolation hangers are required.

2. Plumbing Water Lines: Plumbing water lines in the machine room shall only be isolated if connected to isolated equipment. (See Table B.) Isolator type shall be as listed in Article 1, above.

3. Gas lines shall not be isolated.

4. Fire protection lines shall not be isolated.

PART 4 - SELECTION GUIDE FOR VIBRATION ISOLATION AND WIND RESTRAINTS

TABLE "A" HVAC EQUIPMENT										
	ON GRADE, BASEMENT OR SLAB ON GRADE						ABOVE GRADE			
EQUIPMENT (See Notes)	Size/Type	Mtg	Isol	Nom Defl*	Base	Restr	Isol	Nom Defl*	Base	Restr
Air Handling Units Indoor		Floor	A	0.75	---		A	1.5	---	
		Ceiling	---	---	---	---	E	0.75	---	
Dry Coolers Outdoor Condensing Units/Condensers		Roof	---	---	---	IV	B	1.0 Minimum	B-5	IV
Axial Fans (Inline Type)		Floor	A	0.75	---		A	See Guide	---	
		Ceiling	---	---	---	---	E	See Guide	---	
Base Mounted Pumps	To 15 HP	Floor	A	0.75	B-2		A	0.75	B-2	
	>15 HP	Floor	A	0.75	B-2		A	1.50	B-2	
Boilers		Floor	G	0.10	---	IV	B	0.75	---	
Cabinet Fans & Packaged AHU Indoor	To 1 HP	Floor	F	0.20	---		A	0.75	---	
		Ceiling	---	---	---	---	A	0.75	---	
	>1 HP	Floor	A	0.75	---	=	A	See Guide	---	
		Ceiling	---	---	---	---	A	See Guide	---	
Centrifugal Fans Arr. 1 & 3	Class 1	Floor	A	0.75	B-1		A	See Guide	B-1	
	Class 2 & 3	Floor	A	0.75	B-2		A	See Guide	B-2	
Centrif. Fans (Vent Sets) Arr. 9 & 10	Class 1	Floor	A	0.75	---		A	See Guide	See Note 4	
	Class 2 & 3	Ceiling	---	---	---	---	A	See Guide	B-2	
Curb Mtd. Equip. (Non-Isol.)		Roof	---	---	---	IV	---	---	B-6	---
Fan Coil Units / Indoor Unit (IDU)		Floor	F	0.20	---		A	0.75	---	
		Ceiling	---	---	---	---	E	0.75	---	
Rooftop AHU/AC *(curb mounted)*	< 20 Ton	Roof	---	---	---	---	---	---	---	---
	> 20 Ton	Roof	---	---	---	IV	B	2.50	B-3 See Notes 5,6	---
Rooftop AHU/AC *(dunnage mounted)*	< 10 Ton	Roof	---	---	---	IV	B	1.50	B-8	---
	> 10 Ton	Roof	---	---	---	IV	B	2.50	B-8	---

*See Minimum Deflection Guide for Equipment with Low RPM
*Where Component cannot be point supported, Base Type B-1 shall be used.

Minimum Deflection Guide for Equipment with Low RPM:

Lowest RPM of Rotating Equipment	Minimum Actual Deflection
Less Than 400	3.5"
401 thru 600	2.5"

601 thru 900	1.5”
Greater than 900	0.75”

General Notes for Table:

1. Abbreviations:
   (1) Mtg = Mounting
   (2) ol = Vibration Isolator Type per Section 2.2, Vibration Isolation Types
   (3) Defl = Minimum Deflection of Vibration Isolator
   (4) Base = Base Type per Section 2.4, Equipment Bases
   (5) Restr = Seismic Restraint Type per Section 2.3 Seismic Restraint Types

2. All deflections indicated are in inches. For equipment with variable speed driven components having driven operating speed below 600 rpm, select isolation deflection from minimum deflection guide.

3. For roof applications, use base Type B-5.

4. Units may not be capable of point support. Refer to separate air handling unit specification section. If that section does not provide base and external isolation is required, provide Type B-1 base by this section for entire unit.

5. Static deflection shall be determined based on the deflection guide for Table “A.”

6. Deflections indicated are minimums at actual load and shall be selected for manufacturer’s nominal 5,” 4,” 3,” 2” and 1” deflection spring series; RPM is defined as the lowest operating speed of the equipment.

7. Single stroke compressors may require inertia bases with thicknesses greater than 14” maximum as described for base B-2. Inertia base mass shall be sufficient to maintain double amplitude for 1/8.”

8. Floor mounted fans, substitute base Type B-2 for class 2 or 3 or any fan having static pressure over 5.”

9. Indoor utility sets with wheel diameters less than 24” need not have deflections greater than .75.”

10. Curb-mounted fans with curb area less than 9 square feet are excluded.

11. For equipment with multiple motors, Horsepower classification applies to largest single motor.

END OF SECTION 230548

SECTION 230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White. Unless otherwise directed by owner.

C. Background Color: Red. Unless otherwise directed by owner.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Green.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Refrigerant and Air-Conditioning Condensate Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Green: For supply-, exhaust-, outside-, relief-, return-, and mixed-air ducts.
2. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Refrigerant: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Refrigerant: Natural.

3. Letter Color:

a. Refrigerant: Black.

END OF SECTION 230553

SECTION 230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Testing, Adjusting and Balancing (TAB) to produce design objectives for the following:

1. Balancing Air Systems:

a. Constant-volume air systems.

2. Balancing and Verification that automatic control devices are functioning properly for all equipment covered by this Section including their interlock/monitoring with the fire alarm system.

3. Reporting results of activities and procedures specified in this Section.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC NEBB or TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Owner.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine operating safety interlocks and controls on HVAC equipment.

K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or ASHRAE 111 or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) and metric (SI) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the supply- and exhaust-air dampers through the supply and exhaust-fan discharge.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of exhaust fan components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for adjustment of fans, belts, and pulley sizes to achieve indicated unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-exhuast, full-supply, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being

tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Engineer's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB supervisor who certifies the report.
9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer's name, type, size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports <RTU, AHU, MUA, IDU>: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Cooling-coil static-pressure differential in inches wg.
g. Heating-coil static-pressure differential in inches wg.
h. Heating Coil Temperature Difference in deg F.
i. Cooling Coil Temperature Difference in deg F.
j. Heating and Cooling Entering Air Temperature in deg F.
k. Heating and Cooling Leaving Air Temperature in deg F.
l. Outdoor airflow in cfm.
m. Return airflow in cfm.
n. Outdoor-air damper position.
o. Variable frequency drive settings.

F. Fan Test Reports <SF, EF, TF>: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Air-Terminal-Device Reports <CD, SR, SG, RR, RG, ER, EG>:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.

c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing efforts are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner, Engineer and/or Commissioning Agent.

2. TAB firm test and balance representative shall conduct the inspection in the presence of the Owner, Engineer and/or Commissioning Agent.

3. The Engineer or Commissioning Agent shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.

7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230700 MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes mechanical insulation for duct, equipment, and pipe including the following:

1. Insulation Materials:

a. Flexible elastomeric.
b. Mineral fiber.

2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied jackets.
10. Tapes.
11. Securements.
12. Corner angles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Attachment and covering of heat tracing inside insulation.
3. Insulation application at pipe expansion joints for each type of insulation.
4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Removable insulation at piping specialties, equipment connections, and access panels.
6. Application of field-applied jackets.
7. Application at linkages of control devices.
8. Field application for each equipment type.

C. Field quality-control inspection reports.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

C. Insulation products shall carry ISO 9000/9001/9002 certification or guaranteed to meet the ISO standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 DEFINITIONS

A. Exposed: Piping located in mechanical equipment rooms and in indoor areas which will be visible without removing ceilings or opening access panels.

B. Concealed: Indoor piping which is not exposed.

C. Outdoor: Piping which is exposed to the weather.

D. Underground: Piping which is buried; whereas piping located in a trench below grade is considered concealed.

1.6 REFERENCE STANDARDS

A. Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section.

B. Comply with all applicable national, state and local codes and refer to specification 230500 Common Work Results for HVAC for additional reference standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. Thermal conductivity (k-value) at 75 deg F is 0.25 Btu x in./h x sq. ft. x deg F or less.

1. Available Products:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
d. Or approved equivalent.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.
f. Or approved equivalent.

H. High-Temperature, Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type V, without factory-applied jacket.

1. Available Products:

a. Johns Manville; HTB 23 Spin-Glas.
b. Owens Corning; High Temperature Flexible Batt Insulations.
c. Knauf Insulation
d. Or approved equivalent.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Thermal conductivity (k-value) at 100 deg F is 0.24 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

a. CertainTeed Corp.; Commercial Board.

b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.
g. Or approved equivalent.

J. High-Temperature, Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied jacket.

1. Available Products:

a. Fibrex Insulations Inc.; FBX.
b. Johns Manville; 1000 Series Spin-Glas.
c. Owens Corning; High Temperature Industrial Board Insulations.
d. Rock Wool Manufacturing Company; Delta Board.
e. Roxul Inc.; Roxul RW.
f. Thermafiber; Thermafiber Industrial Felt.
g. Or approved equivalent.

K. Mineral-Fiber, Preformed Pipe Insulation:

1. Available Products:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.
f. Or approved equivalent.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

L. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.
f. Or approved equivalent.

2.3 FIRE-RATED INSULATION SYSTEMS

A. Description: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 2-hour fire rating.

1. Available Products:

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
d. Thermal Ceramics; FireMaster Duct Wrap.
e. 3M; Fire Barrier Wrap Products.
f. Unifrax Corporation; FyreWrap.
g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.
h. Or approved equivalent.

2.4 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Available Products:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.
d. Or approved equivalent.

2.5 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Available Products:

a. Childers Products, Division of ITW; CP-96.
b. Foster Products Corporation, H. B. Fuller Company; 81-33.
c. RBX Corporation.
d. Or approved equivalent.

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Available Products:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.
e. Or approved equivalent.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Available Products:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.
f. Or approved equivalent.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Available Products:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.
f. Or approved equivalent.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Available Products:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.
f. Or approved equivalent.

2.6 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates: Comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Available Products:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.
g. Or approved equivalent.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Available Products:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.
f. Vimasco Corporation; WC-1/WC-5.
g. Or approved equivalent.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.7 SEALANTS

A. Joint Sealants:

1. Available Joint Sealants for Cellular-Glass Products:

a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. Vimasco Corporation; 750.
g. Or approved equivalent.

2. Available Joint Sealants for Polystyrene Products:

a. Childers Products, Division of ITW; CP-70.
b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.
f. Or approved equivalent.

3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F.
6. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Available Products:

a. Childers Products, Division of ITW; CP-76-8.

b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.
f. Or approved equivalent.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, and PVC Jacket Flashing Sealants:

1. Available Products:

a. Childers Products, Division of ITW; CP-76.
b. Mon-Eco Industries, Inc.
c. Vimasco Corporation.
d. Or approved equivalent.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.8 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.9 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Available Products:

a. Johns Manville; Zeston.

b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.
e. Or approved equivalent.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Available Products:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.
d. Or approved equivalent.

2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c. Tee covers.
d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Available Products:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard; Insulrap No Torch 125.
c. Or approved equivalent.

F. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

1. Available Products:

   a. Polyguard; Alumaguard 60.
   b. Or approved equivalent.

2.10 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.11 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.

B. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

1. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Aluminum, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
3. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

C. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

1. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
2. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
3. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

D. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

1. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Aluminum, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
3. Adhesive-backed base with a peel-off protective cover.

E. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

F. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

G. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

H. Wire: 0.062-inch soft-annealed, stainless steel.

2.12 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation with tightly butted joints free of voids and gaps. Vapor barriers shall be continuous. Before installing jacket material, install vapor-barrier system.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Hangers and Anchors: Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

M. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

Q. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches. Seal penetration with firestopping materials to match existing fire rating.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies with firestopping materials to match existing fire rating.

3.5 DUCT AND PLENUM INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not overcompress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply vapor-barrier mastic to open ends, joints, seams, breaks, and punctures in insulation. Create a facing lap for longitudinal seams and

end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from aluminum, at least 0.040 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.7 PIPE INSULATION INSTALLATION

A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Secure single-layer insulation with bands at 12-inch intervals and tighten bands without deforming insulation materials.

C. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with bands at 12-inch intervals.

D. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

E. Cover segmented insulated surfaces with a layer of insulating cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

F. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

G. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

H. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed insulation to pipe with wire or bands and tighten bands without deforming insulation materials. Orient longitudinal joints between half sections in 3 and 9 o'clock positions on the pipe.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor barriers, do not staple longitudinal tabs but secure tabs with additional adhesive or tape as recommended by insulation material manufacturer and seal with vapor-barrier mastic.
5. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

I. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of same insulation material and thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
5. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

J. Insulation Installation on Pipe Fittings and Elbows:

1. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
2. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

K. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
5. Install insulation to flanges as specified for flange insulation application.

L. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

M. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

N. Special Installation Requirements for Flexible Elastomeric and Polyolefin Insulation:

1. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Flanges:

    a. Install pipe insulation to outer diameter of pipe flange.
    b. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
    c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
    d. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3. Insulation Installation on Pipe Fittings and Elbows:

    a. Install mitered sections of pipe insulation.
    b. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints. Provide metal jackets for all outdoor piping.

3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous UL-listed fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies to maintain existing fire rating.

3.10 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ or Other Paintable Jacket Material:

1. Apply two finish coats of interior, flat, latex-emulsion size over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Owner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum jackets.

3.11 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Inspect ductwork, randomly selected by Engineer or Construction Manager, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect field-insulated equipment, randomly selected by Engineer or Construction Manager, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the

"Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

3. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer or Construction Manager, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements. Remove defective Work.

C. Install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures after new materials are installed.

3.12 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in non-conditioned space.
4. Indoor, exposed return located in non-conditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.
8. Refrigerant exhaust duct.

3.13 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. Refer to Division 23 Section “Metal Ducts” and contract drawings for both rectangular and spiral duct systems requiring duct liner.

B. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

C. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

D. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

E. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.0-lb/cu. ft. nominal density.

F. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 1-1/2 inches thick and 1.0-lb/cu. ft. nominal density.

G. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.0-lb/cu. ft. nominal density.

3.14 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option. Refer to Division 23 Section “Metal Ducts” and contract drawings for systems requiring duct liner and/or utilizing a pre-fabricated, double-wall insulated system.

B. Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 3-lb/cu. ft. nominal density.

C. Return-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 3-lb/cu. ft. nominal density.

D. Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 3-lb/cu. ft. nominal density.

E. Exhaust-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 3-lb/cu. ft. nominal density.

3.15 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Fire-suppression piping.
2. Drainage piping located in crawl spaces.
3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.16 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and equipment drain piping (including all HVAC equipment, cooling coil condensate, boiler condensate, etc.): Mineral-Fiber pipe insulation, Type I, 1 inch thick.

B. Refrigerant Suction and Liquid Piping: Insulation shall be the following:

1. Flexible elastomeric, 1 inch thick.

3.17 OUTDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Liquid Piping: Insulation shall be the following:

1. Flexible elastomeric, 1 inch thick.

3.18 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.

E. Piping, Concealed:

1. None.

F. Piping, Exposed:

1. PVC, 30 mils thick.

3.19 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums:

1. VentureClad Jacketing System, or approved equivalent, for outdoor application.

D. Piping:

1. PVC, 30 mils thick.
2. Extruded HDPE jacket for pre-insulated piping systems.

END OF SECTION 230700

SECTION 230710 PENETRATION FIRESTOPPING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

A. Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

B. Repetitive plumbing penetrations in fire-rated floor assemblies. Penetrations exist for the installation of tubs, showers, aerators and other plumbing fixtures.

1.4 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including, but not limited to:

1. Section 078413 – Penetration Firestopping.

1.5 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Firestop Devices (XHJI)
b. Fire Resistance Ratings (BXRH)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

E. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops."

F. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials."

G. International Building Code 2015, NJ Edition.

H. NFPA 101 - Life Safety Code

1.6 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

FM 4991 Approved Contractor
UL Approved Contractor
Hilti Accredited Fire Stop Specialty Contractor

D. Firm with not less than three years of experience with fire stop installation.

E. Successfully completed not less than three comparable scale projects using similar systems.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.1 FIRESTOPPING - GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
3. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

E. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc.
2. 3M.
3. FSI.
4. Or approved equivalent.

2.3 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems) penetrating concrete floors and/or gypsum walls, the following products are acceptable:

1. Hilti Cast-In Place Firestop Device (CP 680-P) for use with combustible penetrants.
2. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
3. Hilti Firestop Speed Sleeve (CP 653) for use with cable penetrations.
4. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
5. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Flexible Firestop Sealant (CP 606)
2. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

E. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

F. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)

G. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)

H. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N)
2. Hilti Firestop Collar (CP 644)
3. Hilti Wrap Strips (CP 648E/648S)

I. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Mortar (CP 637)
2. Hilti Firestop Block (CFS-BL)
3. Hilti Fire Foam (CP 620)
4. Hilti Firestop Board (CP 675T)

J. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Board (CP 675T)

K. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

L. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.3 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.5 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration location on the entire project.

1. The Documentation Form for through penetrations is to include:

a. A Sequential Location Number.
b. The Project Name.
c. Date of Installation.
d. Detailed description of the penetration's location.
e. Tested System or Engineered Judgment Number.
f. Type of assembly penetrated.
g. A detailed description of the size and type of penetrating item.
h. Size of opening.
i. Number of sides of assemblies addressed.
j. Hourly rating to be achieved.
k. Installers Name.

B. Copies of these documents are to be provided to the general contractor at the completion of the project.

C. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's Name, address, and phone number.
3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
4. Date of Installation.
5. Through-Penetration firestop system manufacturer's name.
6. Installer's Name.

3.6 ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION 230710

SECTION 232300 REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 07 Section "Through-Penetration Firestop Systems" for materials and methods for sealing pipe penetrations through fire and smoke barriers.

E. Coordinate pipe fitting pressure classes with products specified in related Sections.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Refrigeration Oil Test Kits: Two each, containing everything required to conduct one test.
2. Refrigerant: Two containers each, with 20 lb of refrigerant.
3. Filter-Dryer Cartridges: Three of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Refrigerants:

a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
b. DuPont Company; Fluorochemicals Div.
c. Elf Atochem North America, Inc.; Fluorocarbon Div.
d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.
e. Or approved equivalent.

2. Refrigerant Valves and Specialties:

a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
b. Danfoss Electronics, Inc.
c. Emerson Electric Company; Alco Controls Div.
d. Henry Valve Company.
e. Sporlan Valve Company.
f. Or approved equivalent.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B 280, Type ACR

B. Annealed-Temper Copper Tube: ASTM B 88, Type L.

C. Wrought-Copper Fittings: ASME B16.22.

D. Bronze Filler Metals: AWS A5.8, Classification BAg-1 (silver)

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, Schedule 40, seamless black steel.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, butt-welded end connection, and raised face.

D. Flanged Unions: 400-psig working pressure, 330 deg F maximum operating temperature; 2 brass tailpiece adapters for solder-end connections to copper tubing; forged-steel flanges for NPS 1 to NPS 1-1/2 and ductile iron for NPS 2 to NPS 3 with 4 plated-steel bolts, with silicon bronze nuts and fiber gasket; and having factory-applied, rust-resistant coating on flanges and bolts.

E. Flexible Connectors: 500-psig operating pressure; seamless tin-bronze or stainless-steel core, high-tensile bronze-braid covering, solder-end connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inches long.

2.4 VALVES

A. Service Valves: 500-psig pressure rating; forged-brass body with copper stubs, brass caps, removable valve core, integral ball check valve, and with solder-end connections.

B. Solenoid Valves: Comply with ARI 760; 250 deg F temperature rating and 400-psig working pressure; forged brass, with polytetrafluoroethylene valve seat, 2-way, straight-through pattern, and solder-end connections; manual operator; fitted with suitable NEMA 250 enclosure of type required by location, with 1/2-inch conduit adapter and 24-V, normally closed holding coil.

C. Pressure-Regulating Valves: Comply with ARI 770; pilot operated, forged brass or cast bronze, stainless-steel bottom spring, pressure-gage tappings, 24-V dc standard coil, and wrought-copper fittings for solder-end connections; suitable for refrigerant specified.

D. Thermostatic Expansion Valves: Comply with ARI 750; brass body with stainless-steel parts; thermostatic-adjustable, modulating type; size and operating characteristics as recommended by manufacturer of evaporator, and factory set for superheat requirements; solder-end connections; with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.

E. Hot-Gas Bypass Valve: Pulsating-dampening design, stainless-steel bellows and polytetrafluoroethylene valve seat; adjustable; sized for capacity equal to last step of compressor unloading; with solder-end connections.

2.5 REFRIGERANT PIPING SPECIALITIES

A. Straight- or Angle-Type Strainers: 500-psig working pressure; forged-brass or steel body with stainless-steel wire or brass-reinforced Monel screen of 80 to 100 mesh in liquid lines up to 1-1/8 inches, 60 mesh in larger liquid lines, and 40 mesh in suction lines; with screwed cleanout plug and solder-end connections.

B. Moisture/Liquid Indicators: 500-psig maximum working pressure and 200 deg F operating temperature; all-brass body with replaceable, polished, optical viewing window with color-coded moisture indicator; with solder-end connections.

C. Replaceable-Core Filter-Dryers: 500-psig maximum working pressure; heavy gage protected with corrosion-resistant-painted steel shell, flanged ring and spring, ductile-iron cover plate with steel cap screws; wrought-copper fittings for solder-end connections; with replaceable-core kit, including gaskets and the following:

1. Filter Cartridge: Pleated media with integral end rings, stainless-steel support, ARI 730 rated for capacity.
2. Filter-Dryer Cartridge: Pleated media with solid-core sieve with activated alumina, ARI 730 rated for capacity.
3. Wax Removal Cartridge: Molded, bonded core of activated charcoal and desiccant with integral gaskets.

D. Permanent Filter-Dryer: 350-psig maximum operating pressure and 225 deg F maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

E. Mufflers: 500-psig operating pressure, welded-steel construction with fusible plug; sized for refrigeration capacity.

2.6 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, within Building: Type ACR drawn-copper tubing

B. Aboveground, outside Building for NPS 2 and Smaller: Type L drawn-copper tubing.

3.2 VALVE APPLICATIONS

A. Install a full-sized, three-valve bypass around each dryer.

B. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve.

1. Install solenoid valves in horizontal lines with coil at top.
2. Electrical wiring for solenoid valves is specified in Division 16 Sections. Coordinate electrical requirements and connections.

C. Install thermostatic expansion valves as close as possible to evaporator.

1. If refrigerant distributors are used, install them directly on expansion-valve outlet.
2. Install valve so diaphragm case is warmer than bulb.
3. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
4. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

D. Install pressure-regulating and pressure relief valves as required by ASHRAE 15. Pipe pressure relief valve discharge to outside.

3.3 SPECIALTY APPLICATIONS

A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.

B. Install strainers immediately upstream from each automatic valve, including expansion valves, solenoid valves, hot-gas bypass valves, and compressor suction valves.

C. Install strainers in main liquid line where multiple expansion valves with integral strainers are used.

D. Install strainers in suction line of steel pipe.

E. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.

F. Install pressure relief valves on ASME receivers; pipe discharge to outdoors.

G. Install replaceable-core filter-dryers in vertical liquid line adjacent to receivers and before each solenoid valve.

H. Install permanent filter-dryers in low-temperature systems, in systems using hermetic compressors, and before each solenoid valve.

I. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

J. Install receivers, sized to accommodate pump-down charge, on systems 5 tons and larger and on systems with long piping runs.

K. Install flexible connectors at or near compressors where piping configuration does not absorb vibration.

3.4 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Division 23 Section "Common Work Results for HVAC."

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

F. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

G. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

H. Install bypass around moisture-liquid indicators in lines larger than NPS 2.

I. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

J. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

K. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports."

L. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe rollers for multiple horizontal runs 20 feet or longer, supported by a trapeze.
4. Spring hangers to support vertical runs.

M. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

N. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 84 inches; minimum rod size, 1/4 inch.
2. NPS 3/4: Maximum span, 84 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 84 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
7. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
8. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.

O. Support vertical runs at each floor.

3.5 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 23 Section " Common Work Results for HVAC."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.6 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.

1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.

    a. System shall maintain test pressure at the manifold gage throughout duration of test.
    b. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
    c. Fill system with nitrogen to raise a test pressure of 150 psig or higher as required by authorities having jurisdiction.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of the conditioned air or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Check compressor oil level above center of sight glass.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves, except bypass valves that are used for other purposes.
5. Check compressor-motor alignment and lubricate motors and bearings.

3.8 CLEANING

A. Before installing copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

B. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.

3.9 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter-dryer after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.

END OF SECTION 232300

SECTION 233113 METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
3. Division 23 Section “Mechanical Insulation” for insulation requirements for systems that do not require duct liner as noted within this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, duct sealing, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes for all systems indicated on drawings.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Seam, joint and wall penetration sealing class and product data.
10. Penetrations through fire-rated and other partitions.
11. Equipment installation based on equipment being used on Project.
12. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
13. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Penetrations of smoke barriers and fire-rated construction.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

E. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

F. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.

D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

F. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

G. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

H. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Or approved equivalent.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Spiral Ducts: Indicated dimensions are the inside clear diameter of the duct.

D. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

E. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

F. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
9. Service: Indoor or outdoor.
10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Exhaust Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
    a. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    b. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    c. Outdoor Air Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
5. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

HVAC System:	Duct Type:	Static Pressure Construction Class	Seal Class	Sealing Applicable	Leakage Class	
					Rectangular Metal	Round Metal
AHU / IDU	SA, RA, OA	2”	A	Note 4	6	3
EF	EA	2"	A	Note 4	6	3
Ventilation Louver	OA at MER’s	2"	A	Note 4	6	3

Notes:

1. Refer to SMACNA Tables for additional information.
2. Ventilation (Outside) Air shall be considered/constructed same as Supply Air.
3. Transverse Joints Only.
4. Joints, Seams and All Wall Penetrations.

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

C. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Requirements Division 01, Division 23 Specification Sections, and Common Work Requirements for HVAC apply to the work specified in this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Turning vanes.
6. Duct-mounted access doors.
7. Duct access panel assemblies.
8. Flexible connectors.
9. Flexible ducts.
10. Duct accessory hardware.
11. Wire mesh grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For all accessories specified, include construction details, dimensions, materials, finishes, bearings and compliance with applicable codes.
2. Performance: Show compliance with pressure drops or specific requirements noted.
3. Provide manufacturer's installation instructions.
4. For duct silencers/sound attenuators, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Duro Dyne Inc.
4. Greenheck Fan Corporation.

5. Ruskin Company.
6. Vent Products Company, Inc.
7. Or approved equivalent.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm

D. Maximum System Pressure: 1-inch wg

E. Frame: 0.052-inch- thick, galvanized sheet steel or 0.063-inch- thick extruded aluminum, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: galvanized steel, plated steel or aluminum, mechanically attached to blade.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum or Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Ruskin Company.
e. Vent Products Company, Inc.
f. Or approved equivalent.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Single blade up to 6 inches blade width; multiple blades for width over 6 inches.
    b. Opposed-blade design for multiple blades dampers.
    c. Round or oval ducts: butterfly type.
    d. Stiffen damper blades for stability.
    e. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze or Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. McGill AirFlow LLC.
    d. Ruskin Company.
    e. Vent Products Company, Inc. Or approved equivalent.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

    a. Single blade up to 6 inches blade width; multiple blades for width over 6 inches.
    b. Opposed-blade design for multiple blades dampers.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze or Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Duro Dyne Inc.
4. McGill AirFlow LLC.
5. Ruskin Company.
6. Vent Products Company, Inc.
7. Young Regulator Company.
8. Greenheck.
9. Or approved equivalent.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Extruded Aluminum Channel, 0.125 inch thick.
3. Reinforced corners.

D. Blades:

1. Multiple blades with maximum blade width of 8 inches.
2. Parallel -blade design.
3. Extruded Aluminum.
4. 0.125 inch thick.
5. Blade Edging: Closed-cell neoprene edging.

E. Blade Axles: 1/2-inch- diameter; hex-shaped Plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Molded synthetic
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

2.5 FIRE DAMPERS

A. Manufacturers:

1. Greenheck.
2. McGill AirFlow Corporation.
3. Nailor Industries Inc.
4. Ruskin Company.
5. Or approved equivalent.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Provide only dynamic type dampers.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Fusible Links: Replaceable, 165 deg F rated.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. CL WARD & Family Inc.
3. Ductmate Industries, Inc.
4. Duro Dyne Inc.
5. Elgen Manufacturing.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.

2. Ductmate Industries, Inc.
3. McGill AirFlow LLC.
4. Pottorff; a division of PCI Industries, Inc.
5. Ventfabrics, Inc.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
7. Or approved equivalent.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Sheet metal, to match duct material, with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 2-by-2-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.
f. Size: Not less than 16 inches by 14 inches. Ducts less than 16 inches in height, install with one dimension 16 inches and other dimension 2 inches less than duct width. Install larger sized doors where required for access.

2. Frame: Same material as door, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.8 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.
4. Or approved equivalent.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
5. Or approved equivalent.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 incheswide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 30 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 30 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.10 FLEXIBLE DUCTS

A. Manufacturers:

1. Type 8M by Flexmaster U.S.A., Inc.
2. Thermaflex Type MK-E by Flexible Technologies, Inc

3. Hart & Cooley, Inc.
4. McGill AirFlow Corporation.
5. Or approved equivalent.

B. Acoustical Insulated Steel Spiral Type:

1. Comply with SMACNA HVAC Flexible Duct Construction Standards and NFPA 90A.

2. Construct ducts of corrosion-resistant coated steel spiral that is mechanically locked or permanently bonded to a CPE inner liner film.

3. Duct shall be factory-insulated with a fiberglass blanket covered with a flame-resistant low permeability metalized vapor barrier jacket. Thermal conductivity of the insulation shall not exceed 0.23 (BTU) (inch)/(hour) (square foot) (degree F) at 75 degrees F mean temperature.

4. The internal working pressure rating shall be at least 4 inches w.g. positive and 0.5 inches w.g. negative.

5. The flexible duct assembly shall carry UL 181, Class 1 duct label.

6. Maximum length shall be 6 feet or less, as dictated by codes. The remainder shall be galvanized sheet metal. Provide flexible duct runs as straight as possible. Provide a minimum installed length of 4 feet at each air terminal.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 WIRE MESH GRILLES

A. Construction: 1/2 inch (12.5 mm) mesh screen with 1 inch (2.5 mm) sheet metal frame, bolted to flanged duct connection.

B. Materials:

1. Screen: Minimum 18 gauge galvanized steel.
2. Frame: Minimum 0.040 inch (1.02 mm) thick galvanized sheet steel.
3. Bolts and nuts: Indoors, galvanized steel; exposed to weather, stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft and control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Fire Dampers:

1. Install dampers in accordance with manufacturer’s UL Installation Instructions, labeling, and NFPA 90A at locations indicated on the drawings. Any damper installation that is not in accordance with the manufacturer’s UL Installation Instructions must be approved prior to installation.
2. Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.
3. Install dampers square and free from racking.
4. The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.
5. Do not compress or stretch the damper frame into the duct or opening.
6. Attach multiple damper section assemblies together in accordance with manufacturer’s instructions. Install support mullions as reinforcement between assemblies as required.
7. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.

E. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts and as indicated. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install volume dampers at the following locations:

    a. Where indicated on drawings and in details.
    b. Where required for balancing.

2. Install steel volume dampers in steel ducts.
3. Install aluminum volume dampers in aluminum ducts.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated and in ductwork where required for testing and adjusting.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
2. At each change in direction and at maximum 50-foot spacing.
3. Upstream from turning vanes.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors at duct connections to equipment, at building expansion joints, at connections between ducts of dissimilar metals and at penetrations of mechanical equipment room walls.

1. Install flexible connections with 2 inches slack in fabric and minimum movement of 1 inch.

M. Install duct test holes where required for testing and balancing purposes.

N. Install wire mesh screen grilles at refrigerant exhaust air ducts and in other places where indicated. Bolt grilles to flanged connections or ducts at terminations.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Inspect turning vanes for proper and secure installation.
4. Operate remote damper operators to verify full range of movement of operator and damper.

3.3 MANUFACTURER’S FIELD SERVICES

A. After start-up, and final corrections and balancing of systems, take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations, as directed.

END OF SECTION 233300

SECTION 233423 HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Ceiling Mounted Centrifugal Fan – General Exhaust.
2. In-line Centrifugal Fans – General Supply/Exhaust.
3. Centrifugal Roof Ventilators – General Exhaust.
4. Sidewall Propeller Fans – General Supply/Exhaust.

B. Extent of power ventilators work required by this Section is indicated on equipment schedules within the contract drawings and by the requirements of the Section. The information contained in the equipment schedules is as follows:

1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound power ratings.
3. Motor ratings and electrical characteristics plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof Curbs.
7. Fan speed controllers.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Component Standard: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard:
1. For Electrical Components: Provide power ventilators that comply with UL 705.

E. Fans and ventilators as specified in this section shall be installed in strict accord with the International Mechanical Code (IMC) Standard – Latest Edition, Chapter 5 for Exhaust Systems.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.6 COORDINATION AND SCHEDULING

A. Coordinate the size and location of structural steel support members.

B. Coordinate the installation of roof curbs, equipment supports, and roof penetrations.

1.7 EXTRA MATERIALS

A. Furnish two sets of belts for each belt-driven fan that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceiling Mounted Centrifugal Fans- General Exhaust:

a. Greenheck Fan Corp.
b. Penn-Barry.
c. Loren Cook Co.

2. In-Line Centrifugal Fans – General Supply/Exhaust:

a. Greenheck Fan Corp.
b. Loren Cook Co.
c. Penn-Barry.
d. Or approved equivalent.

3. Centrifugal Roof Ventilators – General Exhaust:

a. Greenheck Fan Corp.
b. Loren Cook Co.
c. Penn-Barry.
d. Or approved equivalent.

4. Sidewall Propeller Fans – General Supply/Exhaust.

a. Greenheck Fan Corp.
b. Loren Cook Co.
c. Penn-Barry.
d. Or approved equivalent.

2.2 CEILING MOUNTED CENTRIFUGAL FANS – GENERAL EXHAUST

A. Description: Direct-drive centrifugal fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch and accessories.

B. Housing, Outlet and Grille:

1. Housing:

a. Constructed of heavy gauge galvanized steel
b. Profile as low as 6 15/16 inches

2. Outlet:

a. Steel duct collar shall be six or four inches in diameter to accept a six or four inch round duct work.
b. Shall include an aluminum backdraft damper.

3. Grille:

a. Designer; Constructed of high impact polystyrene plastic attached to housing with screws.

C. Fan Wheels:

1. Forward curved centrifugal wheel
2. Constructed of calcium carbonate filled polypropylene
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05

D. Accessories: The following items are required as indicated:

1. Disconnect Switch: NEMA 1, non-fusible type, with thermal-overload protection.
2. Mounting vibration kit.
3. Refer to equipment schedule for additional requirements.

2.3 IN-LINE CENTRIFUGAL FANS – GENERAL SUPPLY/EXHAUST

A. Description: In-line, belt-driven or direct driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, and accessories.

B. Construction: The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

C. Direct-Drive Units: Motor encased in housing out of air stream, factory wired to disconnect located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

F. Bearings: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a pillow block cast iron housing selected for a minimumL50 life in excess of 200,000 hours at maximum cataloged operating speed.

G. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.

H. Accessories: The following accessories are required as indicated:

1. Companion Flanges: For inlet and outlet duct connections.
2. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
3. Refer to equipment schedule for additional requirements.

2.4 CENTRIFUGAL ROOF VENTILATORS – GENERAL EXHAUST

A. Description: Belt-drive or direct-drive centrifugal fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

B. Housing: Removable, galvanized-steel, mushroom-domed top; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel drive shaft; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor shall be isolated from the exhaust air stream.

E. Accessories: The following items are required as indicated:

1. Variable-Speed Controller: Solid-state controls to reduce speed from 100 percent to less than 50 percent for direct drive units.
2. Disconnect Switch: NEMA 3R, non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable 1/2-inch mesh, aluminum.
4. Dampers: Counterbalanced, parallel-blade, back draft dampers mounted in curb base; factory set to close when fan stops.
5. Roof Curbs: Galvanized steel; mitered and welded corners; 2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 2-inch wood nailer. Size as required to suit roof opening and fan base.

a. Configuration: Self-flashing without a cant strip, with mounting flange. Provide manufacturer’s standard rubber curb seal for connection between fan and curb.
b. Overall Height: 18 inches above roof.

6. Vented Curb Extension: Galvanized steel;

2.5 SIDEWALL PROPELLER FANS – GENERAL SUPPLY/EXHAUST

A. Description: Direct drive cast aluminum propeller fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, mounting hardware and accessories.

B. General:

1. Fan arrangement shall be either supply or exhaust, see Fan Schedule
2. Sidewall mounted applications
3. Performance capabilities up to 47,000 cubic feet per minute (cfm) and static pressure to 2.45 inches of water gauge
4. Fans are available in four sizes with nominal wheel diameters ranging from 20 inches through 48 inches (20 - 48 unit sizes)
5. Maximum continuous operating temperature 130° Fahrenheit (54.4 Celsius)
6. Minimum continuous operating temperature -10° F (-23° C)
7. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number

C. Wheel:

1. Propeller constructed of cast aluminum tapered airfoil blades and cast aluminum hubs
2. Securely attached to motor shaft with a standard square key, set screw and tapered bushing
3. Statically and dynamically balanced in accordance with AMCA Standard 204-05
4. The propeller and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency

D. Motors:

1. Motor enclosures: Totally Enclosed Fan Cooled (TEFC).
2. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase.
3. Accessible for maintenance.

E. Drive Frame:

1. Frames and Panels shall be bolted construction
2. Drive frame assemblies and fan panels shall be galvanized steel or painted steel
3. Drive frame shall be formed steel and fan panels shall have pre-punched mounting holes, formed flanges, and a deep formed inserted venturi

F. Accessories: The following items are required as indicated:

1. Disconnect Switch: NEMA 1, non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Dampers: Motorized, balanced with Galvanized Damper Guards.
3. Horizontal Mounting. Engineer to confirm motor orientation in submittal review.
4. Wall Housing: Galvanized Steel, mounting flanges and pre-punched mounting holes.
5. Motor Guard: OSHA approved.

2.6 MOTORS

A. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

B. Enclosure Type: The following features are required as indicated:

1. Open drip proof motors where satisfactorily housed or remotely located during operation.
2. Guarded drip proof motors where exposed to contact by employees or building occupants.

2.7 FACTORY FINISHES

A. Exterior Surfaces: Baked-enamel finish coat after assembly.

B. Aluminum Parts: No finish required.

2.8 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install power ventilators according to manufacturer's written instructions.

B. Support units using the vibration-control devices indicated. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
2. Secure laboratory exhaust fans to equipment supports and mount fans on vibration isolators, furnished by the fan manufacturer, in accordance with Division 23 specifications.
3. Suspend inline units from structural steel support frame using threaded steel rods and vibration isolation springs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Electrical: Conform to applicable requirements in Division 26 Sections.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, and to report results in writing to Engineer.

B. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

D. Refer to Division 23 Section “Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

E. Replace fan and motor pulleys as required to achieve design airflow.

F. Lubricate bearings.

3.6 CLEANING

A. After completion of installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance. Training for exhaust fans shall be included for a total of 1 hour.

B. Schedule training with Owner through the Construction Manager; provide at least 7-days notice of training date.

C. Demonstrate operation of power ventilators. Conduct walking tour of the Project. Briefly identify location and describe function, operation, and maintenance of each power ventilator.

END OF SECTION 233423

SECTION 233713 DIFFUSERS, REGISTERS & GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 8 Section "Fixed Louvers" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.

2. Division 23 Section "Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

3. Division 23 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

3. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

C. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

D. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 DIFFUSER SCHEDULE

A. Square Diffuser <CD>.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Price.
b. Titus.
c. Carnes Co. Inc.
d. Krueger.
e. Or approved equal.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Duct Connection: Round or square as required.
5. Face Style: Square, panel. Refer to schedule for types that required adjustable pattern.
6. Mounting: Flush. Nominal 24”x24” Lay in. Plaster frame where required and coordinate final frame with ceiling type.
7. Pattern: 4 way or as indicated on drawings.
8. Accessories: Include the following:

a. Equalizer deflectors.
b. Operating keys.

B. Round Diffuser CD.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Price.
b. Titus.
c. Carnes Co. Inc.
d. Krueger.
e. Or approved equal.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Duct Connection: Round as required.
5. Face Style: Round, 3-cone.
6. Mounting: Plaster frame or duct mounted as required.
7. Pattern: Fixed.

8. Dampers: Aluminum opposed blade with adjusting screw.
9. Accessories: Include the following:

    a. Equalizer deflectors.
    b. Operating keys.

2.3 REGISTER or GRILLE SCHEDULE

A. Register or Grille SR, ER, RR, RG, TG.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Price.
    b. Titus
    c. Carnes Co. Inc.
    d. Krueger.
    e. Or approved equal.

2. Material: Aluminum or Steel; refer to device schedule.
3. Finish: Baked enamel, color as selected by Architect.
4. Face Blade Arrangement: Fixed horizontal.
5. Rear Blade Arrangement: Fixed vertical.
6. Frame: 1 inch wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed-blade assembly.
9. Accessories: Include plaster frame as applicable and damper operating key.

2.4 LINEAR SLOT DIFFUSER

A. Linear Slot Diffuser

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Price.
    b. Titus.
    c. Carnes Co. Inc.
    d. Krueger.
    e. Or approved equal.

2. Material: Extruded Aluminum
3. Finish: Baked enamel, color as selected by Architect.
4. Frame: Heavy duct extruded aluminum
5. Slots: Refer to device schedule for number and width.
6. Adjustable pattern damper.
7. Insulated sheet metal boot and plenum.

2.5 LINEAR JET-SLOT DIFFUSER

A. Linear Slot Diffuser

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Price.
    b. Titus.
    c. Carnes Co. Inc.
    d. Krueger.

e. Or approved equal.

2. Material: Extruded Aluminum
3. Finish: Baked enamel, color as selected by Architect.
4. Frame: Heavy duct extruded aluminum.
5. Slots: Refer to device schedule for number and width.
6. Adjustable pattern damper.
7. Insulated sheet metal boot and plenum.

2.6 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. It is the responsibility of the contractor to review architectural drawings and provide applicable mounting frame for type of surface or ceiling indicated on architectural drawings. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 233713

SECTION 238126 – SPLIT SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, apply to this Section.

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting and may be connected to ducts. Refer to contract drawings for additional information.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split system air conditioning units that fails in materials or workmanship within the manufacturer’s standard warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Daikin.
2. Mitsubishi.
3. LG.
4. Samsung.
5. Or approved equal.

2.2 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Division 15 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

2.3 CEILING-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter PVC.
5. A condensate pan with antibacterial treatment shall be located under the coil.
6. A thermistor will be located on the liquid and gas line.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan and Motor: Direct drive, multi-speed, ECM type fan and integral condensate pump.

E. Filters: Permanent, cleanable.

2.4 CONCEALED CEILING DUCTED UNIT

A. Cabinet: Cabinet shall allow for ducted supply and return. The cabinet shall be constructed with sound absorbing foamed polystyrene insulation.

B. Refrigerant Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

C. Fan and Motor: Direct drive, multi-speed, ECM motor, statically and dynamically balanced impeller.

D. Filters: Permanent, MERV13 filter kit.

2.5 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating.
2. Variable-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to -4 deg F.

H. Mounting Base: Polyethylene.

2.6 ACCESSORIES

A. Thermostat: Hard-wired functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection, including auto setting.

B. Manufacturer supplied condensate pumps powered via indoor evaporator unit.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Refrigerant Fittings for combination systems operating off of a single outdoor, air-cooled condensing unit.

F. Fresh air intake kit including relay for open/close operation of motor operated damper.

G. Ducted Zone Distribution kit.

2.7 CAPACITIES AND CHARACTERISTICS

A. Refer to contract documents for capacities, characteristics and additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install unit's level and plumb.

B. Install all split-systems whether stand-alone or variable refrigerant volume systems in strict accordance with the manufacturer's installation instructions. Only approved pipe joining methods and fittings may be utilized; no exceptions.

C. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

D. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

E. Install ground-mounting, compressor-condenser components on polyethylene mounting base; minimum 3-inches high.

F. Install roof-mounting compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

G. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

D. Provide control wiring as required by the manufacturer for a complete installation. Wire type shall be 18 AWG, 2 wire, non-polarity, non-shielded, stranded.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units in accordance with Section 01820.

END OF SECTION 238126

SECTION 238239 UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Propeller unit heaters with electric-resistance heating coils.
   2. Propeller unit heaters with hot-water heating coils.
   3. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   1. Plans, elevations, sections, and details.
   2. Location and size of each field connection.
   3. Details of anchorages and attachments to structure and to supported equipment.
   4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
   5. Location and arrangement of integral controls.
   6. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

D. Samples for Verification: Finish colors for each type of cabinet unit heater and wall and ceiling heaters indicated with factory-applied color finishes.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 PROPELLER UNIT HEATERS - ELECTRIC

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko.
2. Indeeco.
3. QMark Electric Heating; a division of Marley Engineered Products.
4. Or approved equivalent.

B. Description: An assembly including casing, coil, fan, and motor in vertical and horizontal discharge configuration with adjustable discharge louvers.

C. Comply with UL 2021.

D. Comply with UL 823.

E. Cabinet: Removable panels for maintenance access to controls.

F. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.

G. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

H. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.

1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

I. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

J. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Type: Permanently lubricated, multispeed.

K. Control Devices:

1. Unit-mounted, variable fan-speed switch.
2. Wall low voltage thermostat.

L. Accessories:

1. Provide manufacturer's universal mounting bracket.

M. Capacities and Characteristics

1. Refer to equipment schedules contained in contract documents for schedule equipment capacities and characteristics.

2.2 WALL AND CEILING HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko.
2. Indeeco.
3. QMark Electric Heating; a division of Marley Engineered Products.
4. Or approved equivalent.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:

1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection.

F. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

G. Control Devices: Unit-mounted low voltage thermostat.

H. Accessories:

1. Provide manufacturer recessed mounting enclosure for heater.
2. Provide manufacture trim-ring for mounting in ceiling.

I. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

J. Capacities and Characteristics:

1. Refer to equipment schedules contained in contract documents for schedule equipment capacities and characteristics.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly, seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Install propeller unit heaters level and plumb.

D. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers.

E. Install wall-mounting thermostats and switch controls in electrical outlet boxes at 48” above finished floor. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

A. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Contractor shall perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Training shall be included for a total of 1 hours; (1) 1-hour session. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 238239

SECTION 260500 COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1) Electrical Drawings

2) Project Specifications

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.4 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.5 SUBMITTALS

A. Product Data: For sleeve seals.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Set cable/conduit sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.
6. Or approved equal.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN, THWN, XHHW, UF, USE, and SO.

D. Multi-conductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC nonmetallic-sheathed cable, Type NM Type SO and Type USE with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Or approved equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway or Type XHHW, single conductors in raceway or Type SE or USE multi-conductor cable as per project plans.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

F. Feeders in Cable Tray: Type TC, single conductors (#1/0 or larger) or multi-conductor cables or Metal-clad cable, Type MC.

G. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

J. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

K. Branch Circuits in Cable Tray: Type TC, multi-conductor tray cables or Metal-clad cable, Type MC.

L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

M. Class 1 Control Circuits: Type THHN-THWN, in raceway.

N. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable, concealed in building finishes or Power-limited tray cable, in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductors at each outlet, with at least 6 inches (150 mm) of slack.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment**.** plus the following special applications:

1. Equipment grounding.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems based on NETA MTS.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: No.4 AWG conductor.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal**,** at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

END OF SECTION 260526

SECTION 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Or approved equal.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Fabco Plastics Wholesale Limited.
d. Seasafe, Inc.
e. Or approved equal

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
5) Or approved equal

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.
6) Or approved equal

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Where applicable, comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

    a. Duct entry provisions, including locations and duct sizes.

b. Frame and cover design.
c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. O-Z Gedney; a unit of General Signal.
6. Wheatland Tube Company.
7. Or approved equal

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel or aluminum.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel or die-cast, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Electri-Flex Co.
4. Lamson & Sessions; Carlon Electrical Products.
5. RACO; a Hubbell Company.
6. Thomas & Betts Corporation.
7. Or approved equal

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.

2. Hoffman.
3. Square D; Schneider Electric.
4. Or approved equal

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type for indoor applications and Type 3R for outdoor applications, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type or flanged-and-gasketed type as indicated for the application.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell Incorporated; Wiring Device-Kellems Division.
b. Wiremold Company (The); Electrical Sales Division.
c. MonoSystems
d. Or approved equal

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Hoffman.
3. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
4. O-Z/Gedney; a unit of General Signal.
5. RACO; a Hubbell Company.
6. Thomas & Betts Corporation.
7. Walker Systems, Inc.; Wiremold Company (The).
8. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
9. Or approved equal

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy or aluminum, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.6 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.7 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.

4. Pipeline Seal and Insulator, Inc.
5. Or approved equal

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT or RNC identified for such use.
2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC. Includes raceways in the following locations:

    a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    b. Mechanical rooms.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT or RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit or IMC.
6. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway or EMT.
7. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser-type, optical fiber/communications cable raceway or EMT.
8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: General-use, optical fiber/communications cable raceway or EMT.

9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel or nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

J. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

K. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
   a. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
   b. Attics: 135 deg F temperature change.
2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

L. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.6 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 230533 HEAT TRACING FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes heat tracing with the following electric heating cables:

1. Self-regulating, parallel resistance.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

1. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 RELATED SECTIONS INCLUDE THE FOLLOWING:

A. Division 01 Section "Construction Waste Management."

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. All heating-cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide pipe freeze protection.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

2. Warranty Period Commencement: This period shall be upon written approval by Owner when recommended by Engineer. "Acceptance by Owner" is defined as written approval by the Owner that the equipment has been operating free from defects in manufacturer assembly and shipping. Warranty period will begin immediately after startup is "satisfactory" completed and units are running reliably, not when delivered or installed. "Satisfactory" completed is after air balancing, water balancing and control interlocks are checked by the Engineer.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

1. Raychem; a division of Tyco Thermal Controls.
2. Chromalox, Inc.; Wiegard Industrial Division; Emerson Electric Company.
3. Delta-Therm Corporation.
4. Or approved equivalent.

B. Heating Element: Pair of parallel No. 16 AWG, nickel-coated stranded copper bus wires embedded in cross-linked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled non-heating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

C. Self Regulating Control: The heating cable shall have a self-regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heating cable output going from 40 deg F pipe temperature operation to 150 deg F pipe temperature operation.

D. Electrical Insulating Jacket: Flame-retardant polyolefin.

E. Cable Cover: Tinned-copper braid, and polyolefin outer jacket with UV inhibitor.

F. Capacities and Characteristics:

1. The heating cable for metal –pipe freeze protection shall be sized according to the table shown below. The required heating cable output rating is in watts per foot at 50 deg F.

Pipe Size (Inches)	Minimum Ambient Temperature (0 deg F)
3 or less	5 Watts
4	5 Watts
6	5 Watts
8	8 Watts
10	2 strips – 5 Watts

2. Coordinate electrical power requirements and line voltages with electrical contractor and electrical contract drawings.

2.2 CONTROLS

A. Remote bulb unit with adjustable temperature range from 30 to 50 deg F.

B. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.

C. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.

D. Corrosion-resistant, waterproof control enclosure.

2.3 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Warning Labels: Refer to Division 23 Section "Identification for HVAC Piping and Equipment."

C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT (LEED)

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install electric heating cable across expansion joints according to manufacturer's written recommendations using slack cable to allow movement without damage to cable.

B. Install electric heating cables after piping has been tested and before insulation is installed.

C. Install electric heating cables according to IEEE 515.1.

D. Install insulation over piping with electric cables according to Division 23 Section "Piping Insulation."

E. Install warning tape on piping insulation where piping is equipped with electric heating cables.

F. Set field-adjustable switches and circuit-breaker trip ranges.

G. Protect installed heating cables, including non-heating leads, from damage.

3.4 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Testing: Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.

1. Test cables for electrical continuity and insulation integrity before energizing.
2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounting cables.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 230533

SECTION 260544 SLEEVES & SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.
f. Or approved equal.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. HOLDRITE.
b. Or approved equal.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Raceways More Than 600 V Concealed within Buildings: 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Wall surfaces directly external to raceways concealed within wall.
2. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with self-adhesive vinyl labels. Repeat legend at 10-foot maximum intervals.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in pull and junction boxes use color-coding conductor tape and write-on tags. Identify source and circuit number of each multi-conductor cable. For single conductor cables, identify phase with color coded tapes in addition to the circuit information on tags .

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use write-on tags. Identify each ungrounded conductor according to source and circuit number.

E. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source and circuit number.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches.
   b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

H. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer or load shedding or other emergency operations.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Emergency system boxes and enclosures.
    f. Motor-control centers.
    g. Disconnect switches.
    h. Enclosed circuit breakers.
    i. Motor starters.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
    1. Colors for 208/120-V Circuits:

        a. Phase A: Black.
        b. Phase B: Red.
        c. Phase C: Blue.

    2. Colors for 480/277-V Circuits:

        a. Phase A: Brown.
        b. Phase B: Orange.
        c. Phase C: Yellow.

    3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate tapes to avoid obscuring factory cable markings.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

END OF SECTION 260553

SECTION 260573 ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.
7. Or approved equal.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.
    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.
4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to Architect's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply one arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:

1. Low voltage switchboard.
2. Low voltage transformers.
3. Panelboard and safety switch over 250 V.
4. Applicable panelboard and safety switch under 250 V.

5. Control panel.

C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 260573

SECTION 260573.1 SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

        1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
        2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

    a. Final one-line diagram.
    b. Final Short-Circuit Study Report.
    c. Short-circuit study data files.
    d. Power system data.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.
7. Or approved equal

B. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.

3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA..

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Include in the report identification of any protective device applied outside its capacity.

END OF SECTION 260573.1

SECTION 260573.16 COORDINATION STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Coordination-study input data, including completed computer program input data sheets.
    b. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:

    a. Final one-line diagram.
    b. Final protective device coordination study.
    c. Coordination study data files.
    d. List of all protective device settings.
    e. Time-current coordination curves.
    f. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications:

1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.
7. Or approved equal

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.
6. Any revisions to electrical equipment required by the study.
7. Study Input Data: As described in "Power System Data" Article.

a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

a. Phase and Ground Relays:

1) Device tag.
2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
3) Recommendations on improved relaying systems, if applicable.

b. Circuit Breakers:

1) Adjustable pickups and time delays (long time, short time, and ground).
2) Adjustable time-current characteristic.

3) Adjustable instantaneous pickup.
4) Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

   a. Power utility's overcurrent protective device.
   b. Medium-voltage equipment overcurrent relays.
   c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
   d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
   e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
   f. Cables and conductors damage curves.
   g. Ground-fault protective devices.
   h. Motor-starting characteristics and motor damage points.
   i. Generator short-circuit decrement curve and generator damage point.
   j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Maintain selectivity for tripping currents caused by overloads.
6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7. Provide adequate time margins between device characteristics such that selective operation is achieved.
8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).

16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
    k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.3 COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

    1. To normal system low-voltage load buses where fault current is 10 kA or less.
    2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA..

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.

K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
4. Include in the report identification of any protective device applied outside its capacity.

3.4 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:

1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
2. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.
3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.5 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141, and voltage sags so as not to affect operation of other utilization equipment on system supplying the motor.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.

2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 260573.16

SECTION 262200 LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.
4. Inrush current for each transformer and a manufacturer table indicating recommended circuit breaker and fuse types and sizes for DOE 2016 transformers.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transformers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Powersmiths International Corp.
4. Siemens Power Transmission & Distribution, Inc.
5. Square D; by Schneider Electric.
6. Or approved equal.

B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. The transformers shall meet the applicable requirements of NEMA ST-20 and ANSI/IEEE C57.12.01 and C57.96, and shall be listed and labeled for conformance to UL 1561.

D. Transformers must comply with the US DOE 2016 minimum requirement.

E. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

F. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

G. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

H. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Enclosure: Ventilated.

1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

C. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

D. Taps for Transformers 15 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

E. Insulation Class, Smaller than 30 kVA: 220 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.

F. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.

G. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.
3. Unit shall meet requirements of NEMA TP 1 when tested according to NEMA TP 2 with a K-factor equal to one.

H. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.

I. Neutral: Rated 200 percent of full load current for K-factor rated transformers.

J. Wall Brackets: Wall brackets fabricated from design drawings signed and sealed by a licensed structural engineer.

K. Fungus Proofing: Permanent fungicidal treatment for coil and core.

L. Low-Sound-Level Requirements: Maximum sound levels when factory tested according to IEEE C57.12.91.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

1. Resistance measurements of all windings at the rated voltage connections and at all tap connections.
2. Ratio tests at the rated voltage connections and at all tap connections.
3. Phase relation and polarity tests at the rated voltage connections.
4. No load losses, and excitation current and rated voltage at the rated voltage connections.
5. Impedance and load losses at rated current and rated frequency at the rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation Resistance Tests:

    a. High-voltage to ground.
    b. Low-voltage to ground.
    c. High-voltage to low-voltage.

9. Temperature tests.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated from design drawings signed and sealed by a licensed structural engineer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.
2. Brace wall-mounted transformers as specified in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base according to manufacturer's written instructions.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

SECTION 262413 SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Metering.
4. Disconnecting and overcurrent protective devices.
5. Instrumentation.
6. Control power.
7. Accessory components and features.
8. Identification.
9. Mimic Bus

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.

8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Seismic Qualification Certificates: For switchboards, overcurrent protective devices, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Routine maintenance requirements for switchboards and all installed components.
b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400.

1.9 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

   a. Ambient Temperature: Not exceeding 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

C. Unusual Service Conditions: NEMA PB 2, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Square D; by Schneider Electric. (design basis: QED switchboard)
2. Eaton.
3. General Electric Company.
4. Siemens Power Transmission & Distribution, Inc.
5. Or approved equal.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 2.

F. Comply with NFPA 70.

G. Comply with UL 891.

H. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

I. Nominal System Voltage: 480Y/277 V.

J. Main-Bus Continuous: See drawings.

K. Short Circuit Current Rating: Switchboards shall be rated with a minimum short circuit current rating of 100,000 rms symmetrical amperes at 480 VAC maximum.

L. Provide fused switches to protect the feeders to the ATS' to achieve the desired short circuit ratings of the ATS' and the downstream busway.

M. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

N. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

O. Indoor Enclosures: Steel, NEMA 250, Type 2.

P. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

Q. Barriers: Between adjacent switchboard sections.

R. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

S. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in switchboard.

T. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

U. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.

V. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

W. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

X. Pull Box on Top of Switchboard:

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

Y. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
3. Copper feeder circuit-breaker line connections.
4. All power cable terminations shall be copper with compression type lugs, including all factory terminations
5. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
6. Ground Bus: Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.
7. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
8. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
9. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
10. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

Z. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

AA. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

BB. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.3 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Eaton.
3. General Electric Company.
4. Siemens Power Transmission & Distribution, Inc.
5. Square D; by Schneider Electric.

B. SPDs: Comply with UL 1449, Type 2.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
e. Surge counter.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 250kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

E. SCCR: Equal or exceed 200 kA.

F. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Main breaker shall be electronic trip 2,500 amp drawout mounted 100% rated circuit breaker. The case of the circuit breaker shall be a polyester thermoset material providing high dielectric strength.

1. The case of the circuit breaker shall be a polyester thermoset material providing high dielectric strength.
2. Circuit breaker operating mechanisms are to be two-step, fully- stored energy devices for quick-make, quick-break operation with a maximum of a five-cycle closing time. Open-

close-open (O-C-O) cycle shall be possible without recharging. Motor operator shall automatically charge when circuit breaker is closed. Actuation of the operating handle or an operation cycle of the circuit breaker motor is to charge the closing springs (step one) and operation of a local "close" button is to close the circuit breaker contact (step two). Closing the circuit breaker contacts shall automatically charge the opening springs.

3. Current-carrying components shall be completely isolated from the accessory mounting area and double insulated from the operator with accessory cover in place.
4. Each phase inside the circuit breaker shall be completely isolated from other phases and ground by polyester thermoset material.
5. Padlocking provisions shall be furnished to receive up to three padlocks when circuit breaker is in the disconnected position, positively preventing unauthorized closing of the circuit breaker contacts.
6. Circuit breaker must be equipped with an interlock to discharge the stored energy spring before the circuit breaker can be withdrawn from its cell.
7. Located on the face of the circuit breaker shall be buttons to open and close the circuit breaker and indicators to show the position of the circuit breaker contacts, status of the closing springs, and circuit breaker position in the cell. An indicator shall show "charged-not OK to close" if closing springs are charged but circuit breaker is not ready to close. Circuit breaker racking system must have positive stops at the connected, test, disconnected and withdrawn positions.
8. Ready-to-close contact must be available to indicate remotely that the circuit breaker is "ready to close." The circuit breaker is ready to close when it is open, spring mechanism is charged, a maintained closing order is not present, a maintained opening order is not present, and the circuit breaker is in an operational position.
9. Circuit breaker shall provide long service life. The 5000 A frames must be certified to 5,000 operations without maintenance.
10. Secondary wiring shall be front accessible and available in cage clamp or ring terminal connections. Secondary wiring must not be accessible when switchgear door is closed.
11. Circuit breaker shall be equipped with a visual contact wear indicator.
12. Low-voltage power circuit breaker arc chutes containing asbestos will NOT be accepted.
13. Mains breakers shall be key interlocked to prevent paralleling.
14. Switchboard shall be provided with 1 floor mounted portable breaker lifting crane

B. Trip System:

1. Circuit breaker trip system shall be an electronic trip unit.
2. Electronic trip unit shall be UL Listed as field-replaceable and upgradeable without special adjustments to the mechanism.
3. Electronic trip unit is to be true RMS current sensing.
4. Trip unit functions shall consist of adjustable long-time pickup and delay, short-time pickup and delay, instantaneous.
5. Adjustable long-time pickup (Ir) and delay shall be available in an adjustable rating plug that is UL Listed as field-replaceable. Adjustable rating plug shall allow for nine long-time pickup settings from 0.4-1 times the sensor plug (In). Other adjustable rating plugs shall be available for more precise settings to match the application. Long-time delay settings shall be in nine bands from 0.5-24 seconds at six times Ir.
6. Short-time pickup shall allow for nine settings from 1.5-10 times Ir. Short-time delay shall be in nine bands from 0.1-0.4 I2t ON and 0-0.4 I2t OFF.
7. Instantaneous settings on the trip units with LSI protection shall be available in nine bands from 2-15 times In. Instantaneous setting shall also have an OFF setting.

8. All trip units shall have the capability for the adjustments to be set and read locally by rotating a switch. Fine increments for pickup adjustments are to be one ampere. Fine increments for delay adjustments are to be one second.
9. Trip unit shall provide local trip indication and capability to indicate local and remote reason for trip, e.g., overload, short circuit.
10. Trip units shall provide additional protection by offering adjustable inverse definite minimum time lag (IDMTL). IDMTL provides optimized coordination by the adjustment of the slope of the long-time delay protection.

C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

D. Group mounted circuit breakers through 1200A

1. Circuit breakers shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
2. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
3. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
4. Line-side circuit breaker connections are to be jaw type.
5. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
6. All trip units shall be removable to allow for field upgrades.

    a. Trip units shall incorporate “True RMS Sensing”and have LED long-time pickup indications.
    b. Trip unit functions shall consist of adjustable long-time pickup and delay, optional short-time pickup and delay, instantaneous and ground-fault pickup and delay
    c. Trip unit shall provide local trip indication for trip, i.e., overload, short circuit or ground fault.
    d. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawings.
    e. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
    f. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker.

2.5 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:

1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Square D Model PM8000 meter (or approved equal) and local display unit with the following features:
    1. Class 0.2S accuracy
    2. Net metering capability
    3. Cycle by cycle RMS measurements updated every ½ cycle.
    4. 512MB nonvolatile memory
    5. RMS 3 phase current voltage and power metering per ANSI C12.20 Class 0.2.
    6. RS485 port, dual Ethernet ports
    7. On-board data storage with 512 MB memory
    8. 4 analog inputs, 2 analog outputs, 10 digital inputs, 2 digital relay outputs, 1 KY pulse output.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

C. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.7 IDENTIFICATION

A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on a photoengraved nameplate.

    1. Nameplate: At least 0.032-inch-thick anodized aluminum, located at eye level on front cover of the switchboard incoming service section.

B. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

C. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.

D. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NECA 400.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.
6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Install spare-fuse cabinet.

I. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Acceptance Testing:

   a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
   b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
   b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
   c. Instruments and Equipment:

      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Switchboard will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 262413

SECTION 262416 PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Electronic grade panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. MCCB: Molded-case circuit breaker.

E. SPD: Surge protective device.

F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Provide time current curves showing the inrush currents for each transformer fed from the switchboard and the proposed circuit breaker trip curve. The time current curve shall demonstrate that the circuit breaker is suitable for use with the proposed transformer.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (fused) and 23 deg F(circuit breaker) to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Circuit Breakers Feeding Transformers: Provide solid state circuit breakers to allow adjustment for DOE 2016 transformer inrush current. Provide time current curves showing the inrush currents for each transformer and the proposed circuit breaker trip curve.

E. Comply with NEMA PB 1, UL 50, and UL 67.

F. Comply with NFPA 70.

G. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.
    c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:

    a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.
    c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

H. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

I. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.

J. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Square D; by Schneider Electric.
2. Eaton.
3. General Electric Company; GE Energy Management - Electrical Distribution.
4. Siemens Energy.
5. Or approved equal.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker, Fused switch, and Lugs only as indicated on schedules.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.

2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D; by Schneider Electric.
5. Or approved equal.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.5 ELECTRONIC-GRADE PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D; by Schneider Electric.
5. Or approved equal.

B. Provide for all computer panelboards as indicated on the drawings.

C. Panelboards: NEMA PB 1; with factory-installed, integral SPD; labeled by an NRTL for compliance with UL 67 and UL 1449 after installing SPD.

D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

E. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

G. SPD.

1. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
2. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

a. Line to Neutral: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.

b. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
c. Neutral to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
d. Line to Line: 2000 V for 480Y/277 V and 1200 V for 208Y/120 V.

3. SCCR: Equal to the SCCR of the panelboard in which installed.
4. Inominal Rating: 20 kA.

H. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussman.
2. Eaton.
3. General Electric Company; GE Energy Management - Electrical Distribution.
4. Siemens Energy.
5. Square D; by Schneider Electric.
6. Or approved equal.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long and short time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFPE Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
    h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    i. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    j. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
    k. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    l. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
2. Fused Switch Features and Accessories:

    a. Standard ampere ratings and number of poles.
    b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.

c. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

2.7 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.3 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:

1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

G. Mount top of trim 90 inches above finished floor unless otherwise indicated.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

J. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

K. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.

L. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

M. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

N. Install filler plates in unused spaces.

O. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

P. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

Q. Mount spare fuse cabinet in accessible location.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
2. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:

        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.7 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
5. STRAIGHT BLADE RECEPTACLES
6. Or approved equal

B. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).
e. Or approved equal

C. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498 Supplement SD.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 8300 (duplex).
    b. Hubbell; HBL8310 (single), HBL8300H (duplex).
    c. Leviton; 8310 (single), 8300 (duplex).
    d. Pass & Seymour; 9301-HG (single), 9300-HG (duplex).
    e. Or approved equal

2.2 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; GF20.
    b. Pass & Seymour; 2084.
    c. Or approved equal

C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; HGF20.
    b. Hubbell; HGF8300.
    c. Leviton; 6898-HG.
    d. Pass & Seymour; 2091-SHG.
    e. Or approved equal

D. Hospital-Grade, Duplex Convenience Receptacles: Comply with UL 498 Supplement SD.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 8300BLS.
    b. Hubbell; HBL8362SA.
    c. Leviton; 8380.
    d. Or approved equal

2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R.

2.3 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: satin-finished stainless steel 0.04-inch-thick.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant **,** die-cast aluminum with lockable cover.

2.4 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White or As selected by Owner, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on inside face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 262813 FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches, panelboards, switchboards, controllers, and motor-control centers.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussman, Inc.
2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.
5. Or approved equal

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Service Entrance: Class L, fast acting or T, fast acting.

B. Feeders: Class RK1, fast acting.

C. Motor Branch Circuits: Class RK1, time delay.

D. Other Branch Circuits: Class J, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813

SECTION 262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: When applicable, submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spares: For the following:

a. Fuses and Fusible Devices for Fused Circuit Breakers: 3
b. Fuses for Fusible Switches: 3

2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

5. Or approved equal

B. Fusible Switch, 1200A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200A and Smaller: NEMA KS 1, TypeHD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.
5. Or approved equal

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

6. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
7. Circuit breaker interrupting ratings: minimum 65kAIC.

C. Molded-Case Circuit-Breaker Features and Accessories: Refer to Drawings for applicability and requirements.

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
6. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at55 percent of rated voltage.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Switch: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories: Refer to Drawings for applicability and requirements.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.
4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay. Provide "dummy" trip unit where required for proper operation.
5. Auxiliary Switch: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

3.3 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply as applicable with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

B. Perform the following field tests and inspections and prepare test reports:

1. As applicable, test mounting and anchorage devices according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Infrared Scanning:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
    b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
    c. Instruments, Equipment and Reports:

        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
        2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges in accordance with setting obtained from the Engineer.

3.7 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SECTION 262923 VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes separately enclosed, pre-assembled, combination variable frequency controllers (VFCs), rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.2 DEFINITIONS

A. BAS: Building automation system.

B. CPT: Control power transformer.

C. EMI: Electromagnetic interference.

D. IGBT: Insulated-gate bipolar transistor.

E. LAN: Local area network.

F. LED: Light-emitting diode.

G. MCP: Motor-circuit protector.

H. NC: Normally closed.

I. NO: Normally open.

J. OCPD: Overcurrent protective device.

K. PCC: Point of common coupling.

L. PID: Control action, proportional plus integral plus derivative.

M. PWM: Pulse-width modulated.

N. RFI: Radio-frequency interference.

O. TDD: Total demand (harmonic current) distortion.

P. THD(V): Total harmonic voltage demand.

Q. VFC: Variable-frequency motor controller. Also, referenced as variable frequency drive (VFD) on the contract documents.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, and furnished specialties and accessories.

B. Shop Drawings: For each VFC indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Enclosure types and details.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of enclosed unit.
f. Features, characteristics, ratings, and factory settings of each VFC and installed devices.
g. Specified modifications.

2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Qualification Data: For qualified testing agency.

C. Seismic Qualification Certificates: For VFCs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

D. Product Certificates: For each VFC, from manufacturer.

E. Harmonic Analysis Study and Report: Comply with IEEE 399 and NETA Acceptance Testing Specification; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze possible operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels.

F. Source quality-control reports.

G. Field quality-control reports.

H. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.

I. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
2. Manufacturer's written instructions for setting field-adjustable overload relays.
3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.

4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test VFC according to IEEE 344 to withstand seismic forces.

1.9 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 14 deg F and not exceeding 104 deg F.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F
3. Humidity: Less than 95 percent (noncondensing).
4. Altitude: Not exceeding 3300 feet.

B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary electrical service.
3. Do not proceed with interruption of electrical systems without Construction Manager's written permission.
4. Comply with NFPA 70E.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.11 COORDINATION

A. Coordinate features of motors, load characteristics, installed units, and accessory devices to be compatible with the following:

1. Torque, speed, and horsepower requirements of the load.
2. Ratings and characteristics of supply circuit and required control sequence.
3. Ambient and environmental conditions of installation location.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Danfoss; VLT Series HVAC drives or comparable product by one of the following:

1. ABB.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.
6. Yaskawa.
7. Or approved equivalent.

B. General Requirements for VFCs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. Application: Constant and Variable torque.

D. VFC Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent

and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

E. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

F. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

G. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 97 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 100 kA.
7. Ambient Temperature Rating: Not less than 14 deg F and not exceeding 104 deg F.
8. Ambient Storage Temperature Rating: Not less than minus 13 deg F and not exceeding 149 deg F
9. Humidity Rating: Less than 95 percent (noncondensing).
10. Altitude Rating: Not exceeding 3300 feet.
11. Vibration Withstand: Comply with IEC 60068-2-6.
12. Overload Capability: 1.5 times the base load current for 60 seconds.
13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
14. Speed Regulation: Plus or minus 5 percent.
15. Output Carrier Frequency: Selectable; 3 to 14 kHz.
16. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

H. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

I. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.
2. Signal: Pneumatic.

J. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 3,600 seconds.
4. Deceleration: 0.1 to 3,600 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

K. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and overvoltage trips.
4. Inverter overcurrent trips.
5. VFC and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor overtemperature fault.

L. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

P. Integral Input Disconnecting Means and OCPD: NEMA AB 1, instantaneous-trip circuit breaker with pad-lockable, door-mounted handle mechanism.
1. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
2. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
3. NC alarm contact that operates only when circuit breaker has tripped.

2.2 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.

a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display and additional readout devices as required, mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

a. A minimum of two programmable analog inputs: 0- to 10-V dc.
b. A minimum of six multifunction programmable digital inputs.

2. Pneumatic Input Signal Interface: 3 to 15 psig.
3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:

a. 0- to 10-V dc.
b. 4- to 20-mA dc.
c. Potentiometer using up/down digital inputs.
d. Fixed frequencies using digital inputs.

4. Output Signal Interface: A minimum of two programmable analog output signal(s) (0- to 10-V dc), which can be configured for any of the following:

a. Output frequency (Hz).
b. Output current (load).
c. DC-link voltage (V dc).
d. Motor torque (percent).
e. Motor speed (rpm).
f. Set point frequency (Hz).

5. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: Two.

G. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status and alarms and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

1. Network Communications Ports: Ethernet and RS-422/485.
2. Embedded BAS Protocols for Network Communications: BACnet, Modbus RTU, Johnson Controls Metasys N2, Siemens Apogee FLN or LON accessible via additional communication card. Contractor to coordinate with controls vendor and equipment vendor shall supply project specific communication card.

2.3 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Provide 5 percent dual DC link reactors.

B. EMI/RFI Filtering: CE marked; certify compliance with IEC 61800-3 for Category C2.

2.4 BYPASS SYSTEMS

A. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor and retransfer shall only be allowed with the motor at zero speed.

C. Bypass Controller: Three-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter input and output and permit safe testing and troubleshooting of the power converter, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Input and Output Isolating Contactors: Non-load-break, NEMA-rated contactors.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

D. Bypass Contactor Configuration: Full-voltage (autotransformer) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
    b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 100 VA.

6. Overload Relays: NEMA ICS 2.

    a. Solid-State Overload Relays:

        1) Switch or dial selectable for motor-running overload protection.
        2) Sensors in each phase.
        3) Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
        4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
        5) Analog communication module.

    b. NO isolated overload alarm contact.
    c. External overload reset push button.

2.5 OPTIONAL FEATURES

A. Damper control circuit with end of travel feedback capability.

B. Sleep Function: Senses a minimal deviation of a feedback signal and stops the motor. On an increase in speed-command signal deviation, VFC resumes normal operation.

C. Motor Preheat Function: Preheats motor when idle to prevent moisture accumulation in the motor.

D. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

E. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

2.6 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R.
3. Kitchen and Wash-Down Areas: Type 3R.
4. Other Wet or Damp Indoor Locations: Type 3R.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

2.7 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, type.

a. Push Buttons: Covered types; maintained.
b. Pilot Lights: LED types; push to test.
c. Selector Switches: Rotary type.
d. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

B. NO bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Supplemental Digital Meters:

1. Elapsed-time meter.
2. Kilowatt meter.
3. Kilowatt-hour meter.

F. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 3R or Type 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Cooling Fan and Exhaust System: For NEMA 250, Type 1 or Type 12; UL 508 component recognized: Supply fan, with stainless steel intake and exhaust grills and filters; 120 -V ac; obtained from integral CPT.

2.8 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to its specified motor.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HARMONIC ANALYSIS STUDY

A. Perform a harmonic analysis study to identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze designated operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels.

B. Prepare a harmonic analysis study and report complying with IEEE 399 and NETA Acceptance Testing Specification.

3.3 INSTALLATION

A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Wall-Mounting Controllers: Install VFCs on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

C. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in control circuits if not factory installed.

F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

H. Comply with NECA 1.

3.4 IDENTIFICATION

A. Identify VFCs, components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each VFC. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each VFC 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. VFCs will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

E. Set field-adjustable circuit-breaker trip ranges.

F. Set field-adjustable pressure switches.

3.9 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance. Training for VFCs shall be included for a total of 4 hours; (4) 1-hour sessions.

END OF SECTION 262923

SECTION 262933 - CONTROLLERS FOR FIRE PUMP DRIVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Full-service, reduced-voltage controllers rated 600 V and less.
2. Controllers for pressure-maintenance pumps.

1.2 DEFINITIONS

A. ATS: Automatic transfer switch(es).

B. ECM: Electronic control module.

C. MCCB: Molded-case circuit breaker.

D. NO: Normally open.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of product indicated.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Show tabulations of the following:

    a. Each installed unit's type and details.
    b. Enclosure types and details for types other than NEMA 250, Type 2.
    c. Factory-installed devices.
    d. Nameplate legends.
    e. Short-circuit current (withstand) rating of integrated unit.
    f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
    g. Specified modifications.

4. Include diagrams for power, signal, alarm, control wiring, and pressure-sensing tubing.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For each type of product indicated, from manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Environmental Limitations:

1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.
2. Altitude Rating: Not exceeding 6600 feet unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 20 and NFPA 70.

B. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Seismic Performance: Fire-pump controllers and alarm panels shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FULL-SERVICE CONTROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. Joslyn Clark Corporation.

3. Tornatech.
4. Or approved equal.

B. General Requirements for Full-Service Controllers:

1. Comply with NFPA 20 and UL 218.
2. Combined automatic and nonautomatic operation.
3. Combined with automatic transfer switch.
4. Factory assembled, wired, and tested; continuous duty rated.

C. Method of Starting:

1. Pressure-switch actuated.

a. Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
b. System pressure recorder, electric ac driven, with spring backup.
c. Programmable minimum-run-time relay to prevent short cycling.
d. Programmable timer for weekly tests.

2. Solid-State Controller: Reduced-voltage type.
3. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.

D. Method of Stopping: Automatic and nonautomatic shutdown after automatic starting.

E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

G. Door-Mounted Operator Interface and Controls:

1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
2. Method of Control and Indication:

a. Microprocessor-based logic controller, with multiline digital readout.
b. Touchscreen keypad.
c. LED alarm and status indicating lights.

3. Local and Remote Alarm and Status Indications:

a. Controller power on.
b. Motor running condition.
c. Loss-of-line power.
d. Line-power phase reversal.

e. Line-power single-phase condition.

4. Audible alarm, with silence push button.
5. Nonautomatic START and STOP push buttons or switches.

H. Optional Features:

1. Extra Output Contacts:

a. One NO contact(s) for motor running condition.

2. Local alarm bell.
3. Door-mounted thermal or impact printer for alarm and status logs.
4. Operator Interface Communications Ports: USB, Ethernet, and RS485.

I. ATS:

1. Complies with NFPA 20, UL 218, and UL 1008.
2. Integral with controller as a listed combination fire-pump controller and power transfer switch.
3. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.
4. Allows manual transfer from one source to the other.
5. Alternate-Source Isolating and Disconnecting Means: Integral molded-case switch, with an externally mounted operating handle.
6. Alternate-Source Isolating and Disconnecting Means: Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker shall be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
7. Local and Remote Alarm and Status Indications:

a. Normal source available.
b. Alternate source available.
c. In normal position.
d. In alternate position.
e. Isolating means open.

8. Audible alarm, with silence push button.
9. Nonautomatic (manual, nonelectric) means of transfer.
10. Engine test push button.
11. Start generator output contacts.
12. Timer for weekly generator tests.

2.3 CONTROLLERS FOR PRESSURE-MAINTENANCE PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. Joslyn Clark Corporation.
3. Tornatech.
4. Or approved equal

B. General Requirements for Pressure-Maintenance-Pump Controllers:

1. Type: UL 508, factory-assembled, -wired, and -tested, across-the-line controller; for combined automatic and manual operation.
2. Enclosure: UL 508 and NEMA 250, Type 2 for wall-mounting.
3. Factory assembled, wired, and tested.
4. Finish: Manufacturer's standard color paint.

C. Rate controller for scheduled horsepower and include the following:

1. Fusible disconnect switch.
2. Pressure switch.
3. Hand-off-auto selector switch.
4. Pilot light.
5. Running period timer.

2.4 ENCLOSURES

A. Fire-Pump Controllers, ATS, Remote Alarm Panels, and Low-Suction-Shutdown Panels: NEMA 250, to comply with environmental conditions at installed locations and NFPA 20.

1. Indoor Locations Subject to Dripping Noncorrosive Liquids: Type 2 (IEC IP11).

B. Enclosure Color: Manufacturer's standard "fire-pump-controller red".

C. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

D. Optional Features:

1. Floor stands, 12 inches high, for floor-mounted controllers.

2.5 SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire-pump controllers according to requirements in NFPA 20 and UL 218.

1. Verification of Performance: Rate controllers according to operation of functions and features specified.

B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 CONTROLLER INSTALLATION

A. Coordinate installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Install controllers within sight of their respective drivers.

D. Connect controllers to their dedicated pressure-sensing lines.

E. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

F. Floor-Mounting Controllers: Install controllers on concrete base(s), using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

G. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

H. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

I. Comply with NEMA ICS 15.

3.2 REMOTE ALARM PANEL INSTALLATION

A. Install panels on walls with tops not higher than 72 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For ATS not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

3.3 POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70, and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 CONTROL AND ALARM WIRING INSTALLATION

A. Install wiring between controllers and remote devices and facility's central monitoring system. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."

B. Install wiring between remote alarm panels and controllers. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."

C. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 284621.11 " Addressable Fire-Alarm Systems."

D. Bundle, train, and support wiring in enclosures.

E. Connect remote manual and automatic activation devices where applicable.

3.5 IDENTIFICATION

A. Comply with requirements in NFPA 20 for marking fire-pump controllers.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

B. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

    a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
    b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
    c. Test continuity of each circuit.

2. Verify and Test Each Electric-Drive Controller:

a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Construction Manager before starting the motor(s).
b. Test each motor for proper phase rotation.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Construction Manager and authorities having jurisdiction.
2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
3. Engage manufacturer's factory-authorized service representative to be present during the testing.
4. Perform field acceptance tests as outlined in NFPA 20.

D. Controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Adjust controllers to function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain controllers and remote alarm panels.

END OF SECTION 262933

SECTION 263213 -NATURAL GAS EMERGENCY GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged engine-generator sets for emergency power supply with the following features:

1. Natural gas engine.
2. Unit mounted cooling system.
3. Unit mounted control and monitoring.
4. Load banks.
5. Outdoor enclosure.

B. Related Sections include the following:

1. Section 26360 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints, designing vibration isolation bases and roof curbing.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachment of dunnage or roof curb to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces as defined in the New Jersey adopted 2018 International Building Code. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For installer and manufacturer.

E. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

F. Field quality-control test reports.

G. Warranty: Special warranty specified in this Section.

H. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Specification Sections for Operation and Maintenance Data, include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

I. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

1.5 FACTORY TESTING

A. Prior to shipping, all factory assembled packaged equipment, including generators and automatic transfer switches (ATS), shall be factory tested, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The "Run Test Report" shall be submitted to Owner for approval, prior to acceptance of unit for payment.**

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two (2) hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 120 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Comply with all applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation. Generator's silencer shall be a critical grade silencer.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 0 to 110 degrees F.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet.

B. Unusual Service Conditions: Engine-generator equipment and installation are required to operate under the following conditions:

1. High salt-dust content and high humidity in the air due to sea-spray evaporation from close proximity to ocean and bays.

1.8 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.9 WARRANTY

A. Special Warranty: Manufacturer's full parts and labor warranty in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide twelve (12) months of full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as

required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements indicated on drawings and within project's technical specifications. Basis of design is a natural gas fired emergency generator as manufactured by Kohler Power Systems or Approved Equal.

2.2 NATURAL GAS ENGINE-GENERATOR SET

A. The engine-generator set and its components shall be prototype-tested, factory-built, and factory production-tested before shipping.

B. Factory-assembled and -tested, engine-generator set.

C. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

D. Provide one-source responsibility for the generating system, automatic transfer switches and accessories.

E. The 60 Hz generator set shall be provided with a UL 2200 listing.

F. Provide generator with IBC seismic certification.

G. The generator set shall be capable of accepting rated load in a single step.

H. The 60 Hz generator set shall meets NFPA 110, Level 1 standards. Furnish with all necessary accessories installed per NFPA standards.

I. Alternator standard features include the following:

1. Pilot-excited, permanent magnet (PM) alternator.
2. The brushless, rotating-field alternator shall have broad range reconnectability.

J. Alternator Specifications:

1. NEMA MG1, IEEE and ANSI standards compliance for temperature rise and motor starting.
2. Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.

3. Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
4. Self-ventilated and dripproof construction.
5. Voltage waveform from a two-thirds pitch stator and skewed rotor.
6. Digital solid state, volts-per-hertz voltage regulator with +/-0.25% no-load to full-load regulation.
7. Brushless alternator with brushless pilot exciter.
8. 4-pole, rotating field type alternator.
9. Solid state voltage regulator.
10. Insulation – NEMA MG1, Class H, 150°C, Standby temperature rise.
11. 1 sealed bearing.
12. Flexible disc coupling.
13. Full amortisseur windings.
14. Voltage regulation, no-load to full-load, shall be controller dependent.
15. One-step load acceptance shall be 100% of alternator rating.
16. Unbalanced load capability shall be 100% of rated standby current.

K. Engine Specifications:

1. Natural gas fired, 4-cycle, turbocharged, charged air-cooled engine.
2. V-12 cylinder arrangement.
3. Compression ratio of 10.5:1.
4. Piston speed of 1677 ft./min.
5. Main bearings – 12 precision half-shell.
6. 1800 rpm.
7. Cast iron cylinder head.
8. Forged steel crankshaft.
9. Electronic governor.
10. Isochronous frequency regulation, no-load to full-load.
11. Fixed frequency (60 HZ).
12. Dry air cleaner.

L. Exhaust Specifications:

1. Wet exhaust manifold type.
2. Flanged outlet at catalyst.
3. Maximum allowable back pressure of 3 in. Hg.
4. Exhaust flow at rated KW of 2011 cfm.
5. Exhaust temperature at rated KW, dry exhaust, of 1112°F.

M. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 75 dBA or less.

N. Engine Electrical Specifications:

1. Battery charging alternator:

    a. Negative ground.
    b. 24 volts (DC).
    c. 45 ampere rating.

2. Starter motor rated voltage of 24 volts (DC).
3. Battery minimum cold cranking amps – (2) at 1000 CCA each.
4. Battery voltage of 12 volts (DC).

O. Fuel Specifications:

1. Natural Gas.
2. Fuel supply line inlet of 3.0 NPTF.
3. Natural gas fuel supply pressure between 7.0 and 11.0 in. wg.
4. Secondary Gas Regulators.
5. Fuel-Shutoff Solenoid Valves.
6. Flexible Fuel Connectors.
7. Maximum natural gas consumption at 100% Standby 3984 cfh.

P. Lubrication Specifications:

1. Full pressure type.
2. 44.5 quart oil pan capacity with filter.
3. Two (2) cartridge oil filters per engine.
4. Water-cooled oil cooler.
5. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
6. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

Q. Cooling Specifications:

1. Maximum ambient temperature of 122°F.
2. Engine jacket water capacity of 11 gallons.
3. Radiator system capacity (including engine) of 43 gallons.
4. Engine jacket water flow rate of 174 gpm
5. Heat rejected to cooling water at rated KW, dry exhaust, of 20,400 Btu/min.
6. Heat rejected to air charge cooler at rated KS, dry exhaust, of 1300 Btu/min.
7. Centrifugal water pump.
8. 52 inch diameter fan (including blades).
9. 28 HP fan.
10. Maximum restriction of cooling air, intake and discharge side of radiator, of 0.5 in. wg.
11. Radiator-cooled cooling air 19,500 scfm.
12. Combustion air 664 cfm
13. Total heat rejected to ambient air 4316 Btu/minute.
14. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

15. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
16. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
17. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

R. Controller Specifications:

1. Generator to be provided with integral controller equal to Kohler Decision-Maker 550 Controller which provides advanced control, system monitoring and system diagnostics with remote monitoring capabilities. At minimum, controller shall be furnished with the following:

    a. Digital display and keypad which shall provide easy local data access.
    b. Remote communication thru a PC via network or modem configuration.
    c. Measurements shall be selectable in metric or English units.
    d. Controller shall support Modbus® protocol.
    e. Integrated voltage regulator with ±0.25% regulation.
    f. Built-in alternator thermal overload protection.
    g. NFPA 110 Level 1 capability.

S. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

T. Standard Features to be provided:

1. Alternator Protection.
2. Battery Rack and Cables.
3. Closed Crankcase Ventilation.
4. Integral Vibration Isolation.
5. Local Emergency Stop Switch.
6. Low Coolant Level Shutdown.
7. Oil Drain Extension.
8. Operation and Installation Literature.
9. Three-Way Exhaust Catalyst.

U. Optional Features to be provided:

1. UL 2200 Listing.
2. IBC Seismic Certification.
3. Unit Sound & Weather Enclosure with Internal Silencer (Steel).
4. Critical Grade Silencer.
5. Gas Filter.
6. Secondary Gas Solenoid Valve.
7. Customer Connection.

8. Dry Contact Kit (isolated alarm).
9. Prime Power Switch.
10. Remote Audiovisual Alarm Panel.
11. Remote Emergency Stop
12. Block Heater; 6000 Watt, 208 Volt, 1ø.
13. Alternator Strip Heater
14. Batteries
15. Battery Charger, Equalize/Float Type
16. Battery Heater
17. Line Circuit Breaker.
18. Air Cleaner Restriction Indicator.
19. Certified Test Report.
20. Engine Fluids Added.
21. Rated Power Factor Testing.
22. Rodent Guards.
23. Manufacturer's Service Representative's General Maintenance literature.
24. Generator set's NFPA 110 literature.
25. 5-Year Comprehensive full parts and labor warranty.

V. Additional Capacities and Characteristics as specified on Contract Drawings.

1. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

W. Generator Circuit Breaker: Insulated-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

X. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

Y. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.3 OUTDOOR NATURAL GAS GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, Sound attenuated, weatherproof aluminum housing, wind resistant up to 150 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure. Enclosure shall be provided by generator manufacturer as a prefabricated packaged unit.

B. Description: Prefabricated enclosure with the following features:

1. Construction: Aluminum clad, integral structural-steel-framed enclosure, fully enclosing generator, which shall be mounted on a concrete foundation. Provide sound enclosure features including the addition of sound attenuation acoustic insulation that meets UL 94 HF1 flammability classifications and repels moisture absorption. Provide optional seashore grade paint finish providing a minimum 6000 hour salt spray test rating. Final coating shall be a dipped process.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads. Provide high-wind (150 mph) bracing.
3. Louvers: Equipped with bird screen and filters excluding exterior dust, birds, and rodents.
4. Hinged Doors: With padlocking provisions and automatic door holders to keep doors open during maintenance.
5. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
6. Muffler Location: Critical grade silencer installed within generator enclosure. Provide flexible exhaust connector and rain cap.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

E. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

F. Provide one-source responsibility for the generating system, automatic transfer switches and accessories.

G. The 60 Hz generator set shall be provided with a UL 2200 listing.

H. The generator set shall be capable of accepting rated load in multiple steps. See Mechanical Drawings for step delays specified for building's mechanical systems.

I. The 60 Hz generator set shall meets NFPA 110, Level 1 standards. Furnish with all necessary accessories installed per NFPA standards.

J. Provide generator with IBC seismic certification.

K. Alternator standard features include the following:

1. Pilot-excited, permanent magnet (PM) alternator.
2. The brushless, rotating-field alternator shall have broad range reconnectability.

L. Alternator Specifications:

1. NEMA MG1, IEEE and ANSI standards compliance for temperature rise and motor starting.
2. Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
3. Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
4. Self-ventilated and dripproof construction.
5. Voltage waveform from a two-thirds pitch stator and skewed rotor.
6. Digital solid state, volts-per-hertz voltage regulator with +/-0.25% no-load to full-load regulation.
7. Brushless alternator with brushless pilot exciter.
8. 4-pole, rotating field type alternator.
9. Solid state voltage regulator.
10. Insulation – NEMA MG1, Class H, 150°C, Standby temperature rise.
11. 1 sealed bearing.
12. Flexible disc coupling.
13. Full amortisseur windings.
14. Voltage regulation, no-load to full-load, shall be controller dependent.
15. One-step load acceptance shall be 100% of alternator rating.
16. Unbalanced load capability shall be 100% of rated standby current.

M. Engine Specifications:

1. Natural gas, turbocharged, charged air-cooled engine.
2. 6 cylinder inline arrangement.
3. Compression ratio of 16.0:1.
4. Piston speed of 1950 ft./min.
5. Main bearings – 7, replaceable insert.
6. 1800 rpm.
7. Nickel-chromium head, nickel-silicone stem.
8. Forged steel crankshaft.

9. Electronic governor.
10. Isochronous frequency regulation, no-load to full-load.
11. Fixed frequency (60 HZ).
12. Dry air cleaner.

N. Exhaust Specifications:

1. Dry exhaust manifold type.
2. Flanged outlet at catalyst.
3. Maximum allowable back pressure of 1.2 ib. Hg. minimum, 3 in. Hg. maximum.
4. Exhaust flow at rated KW of 2649 cfm.
5. Exhaust temperature at rated KW, dry exhaust, of 835°F.

O. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 75 dBA or less.

P. Engine Electrical Specifications:

1. Battery charging alternator:

   a. Negative ground.
   b. 24 volts (DC).
   c. 24 ampere rating.

2. Starter motor rated voltage of 24 volts (DC).
3. Battery minimum cold cranking amps – (2) at 950 CCA each.
4. Battery voltage of 12 volts (DC).

Q. Fuel Specifications:

1. Natural gas.

R. Lubrication Specifications:

1. Full pressure type.
2. 44.4 quart oil pan capacity with filter.
3. One (1) cartridge oil filters per engine.
4. Water-cooled oil cooler.
5. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
6. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

S. Cooling Specifications:

1. Maximum ambient temperature of 122°F.
2. Engine jacket water capacity of 4.8 gallons.
3. Radiator system capacity (including engine) of 17.8 gallons.
4. Engine jacket water flow rate of 124 gpm
5. Heat rejected to cooling water at rated KW, dry exhaust, of 11,042 Btu/min.
6. Heat rejected to air charge cooler at rated KS, dry exhaust, of 6033 Btu/min.
7. Centrifugal water pump.
8. 38 inch diameter fan (including blades).
9. 24 HP fan.
10. Radiator-cooled cooling air 23,000 scfm.
11. Maximum restriction of cooling air, intake and discharge side of radiator, of 0.5 in. wg.
12. Combustion air 1165 cfm
13. Total heat rejected to ambient air 6806 Btu/minute.
14. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
15. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
16. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
17. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

T. Controller Specifications:

1. Generator to be provided with integral controller equal to Kohler Decision-Maker 550 Controller which provides advanced control, system monitoring and system diagnostics with remote monitoring capabilities. At minimum, controller shall be furnished with the following:

    a. Digital display and keypad which shall provide easy local data access.
    b. Remote communication thru a PC via network or modem configuration.
    c. Measurements shall be selectable in metric or English units.
    d. Controller shall support Modbus® protocol.
    e. Integrated voltage regulator with ±0.25% regulation.
    f. Built-in alternator thermal overload protection.
    g. NFPA 110 Level 1 capability.

U. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

V. Standard Features to be provided:

1. Alternator Protection.
2. Battery Rack and Cables.

3. Local Emergency Stop Switch.
4. Oil Drain Extension.
5. Operation and Installation Literature.

W. Optional Features to be provided:

1. UL 2200 Listing.
2. IBC Seismic Certification.
3. Unit Weather & Sound Enclosure with Internal Silencer (Salt grade Aluminum).
4. Critical Grade Silencer.
5. Customer Connection.
6. Dry Contact Kit (isolated alarm).
7. Remote Audiovisual Alarm Panel. (coordinate panel location with owner)
8. Remote Emergency Stop. (coordinate panel location with owner)
9. Remote Serial Annunciator Panel. (coordinate panel location with owner)
10. Block Heater; 2500 Watt, 208 Volt, 1ø.
11. Alternator Strip Heater
12. Batteries
13. Battery Charger, Equalize/Float Type
14. Battery Heater
15. Line Circuit Breaker (400A, 100% rated).
16. Heavy Duty Air Cleaner.
17. Crankcase Emissions Canister.
18. Air Cleaner Restriction Indicator.
19. Rated Power Factor Testing.
20. Engine Fluids Added.
21. Rodent Guards.
22. Manufacturer's Service Representative's General Maintenance literature.
23. Generator set's NFPA 110 literature.
24. 5-Year Comprehensive full parts and labor warranty.

X. Additional Capacities and Characteristics as specified on Contract Drawings.

1. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

Y. Generator Circuit Breaker: Insulated-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

Z. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall

open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

AA. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.4 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof aluminum housing, wind resistant up to 150 mph with subbase fuel tank package. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure. Enclosure shall be provided by generator manufacturer as a prefabricated packaged unit.

B. Description: Prefabricated enclosure with the following features:

1. Construction: Aluminum clad, integral structural-steel-framed enclosure, fully enclosing generator, which shall be mounted on a concrete foundation. Provide sound enclosure features including the addition of sound attenuation acoustic insulation that meets UL 94 HF1 flammability classifications and repels moisture absorption. Provide optional seashore grade paint finish providing a minimum 6000 hour salt spray test rating. Final coating shall be a dipped process.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads. Provide high-wind (150 mph) bracing.
3. Louvers: Equipped with bird screen and filters excluding exterior dust, birds, and rodents.
4. Hinged Doors: With padlocking provisions and automatic door holders to keep doors open during maintenance.
5. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
6. Muffler Location: Critical grade silencer installed within generator enclosure. Provide flexible exhaust connector and rain cap.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.5 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolation Pads:

1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Infused nonwoven cotton or synthetic fibers.
5. Load-bearing metal plates adhered to pads.
6. Sandwich-Core Material: Resilient and elastomeric.

    a. Infused nonwoven cotton or synthetic fibers.

2.6 FINISHES

A. Outdoor Enclosures and Exterior Exposed Components: Special seashore finish over corrosion-resistant pretreatment and compatible primer. Final coat to have a minimum 6000 hours salt spray test rating. Final coating shall be a dipped process.

2.7 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.

8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify County no fewer than two (2) weeks in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without County’s written permission.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases.
2. Coordinate size and location of concrete bases for packaged engine generator on grade. Cast anchor-bolt inserts into bases.

C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Install engine-generator in a walk-in enclosure with elastomeric isolator pads having a minimum deflection of 1 inch on contractor furnished roof dunnage or curb. Secure enclosure to roof dunnage or curb per hurricane ti-down requirements.

1. Comply with requirements for seismic control devices specified in the New Jersey edition of the 2015 International Building Code.
2. Comply with requirements for vibration isolation devices specified in this section.

E. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Piping shall be same diameter as muffler outlet.

F. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints.

G. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine-generator to allow service and maintenance.

B. Connect cooling-system water piping to engine-generator set with flexible connectors.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Connect fuel piping to engines with a gate valve and union and flexible connector.

E. Vent gas pressure regulators outside generator’s enclosure a minimum of 60 inches from enclosure’s openings.

F. Ground equipment according to other Division 16 Specification Sections for grounding and bonding for electrical systems.

G. Connect wiring according to other Division 26 Specification for electrical power conductors and cables.

H. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

I. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify all electrical system components.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test. Contractor shall provide portable load bank required for generator’s performance test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test of the generator and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four (4) locations along the adjacent building, and compare measured levels with required values.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest as specified above.

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

L. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 26321

SECTION 26 36 00 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

2. Bypass/isolation switches.

3. Remote annunciation systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Qualification Data: For manufacturer and testing agency.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain bypass/isolation switches, through one source from a single manufacturer. All equipment shall be obtained from its original manufacturer or an authorized distributor thereof. Re-labeled or repackaged OEM equipment shall not be accepted.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NEMA ICS 1.

F. Comply with NFPA 70.

G. Comply with NFPA 99.

H. Comply with NFPA 110.

I. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Architect, Construction Manager, and Owner no fewer than

fourteen (14) days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:

a. ASCO Power Technologies, LP.
b. Or approved equal

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008, without the use of specific fuse or breaker protection (any breaker rating)..

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.

2. Switch Action: Double throw; mechanically held in both directions.

3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.

2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.

3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

K. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate

position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

1. Shall be able to monitor transfer switch and generator system state, metering, health, active timers, historical logs, transfer statistics, and past activity.

2. Shall be able to see configured settings.

3. Shall be able to interface with email server for notices and alerts.

4. Shall have 128-bit encryption for enhanced data security.

5. Retrieve information using standard open protocols.

6. Remotely transfer between sources with proper authentication.

G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

I. Automatic Transfer-Switch Features:

1. Under-voltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained under-voltage of emergency source, provided normal supply has been restored.

5. Test Switch: Simulate normal-source failure.

6. Switch-Position Pilot Lights: Indicate source to which load is connected.

7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal

source.

12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

13. Provide an engine control wiring system that monitors conditions, annunciates faults and starts the engine.

14. Provide a load shed module for all non-priority 1 transfer switches.

J. Digital Power Meter:

1. Furnish Digital Power Managers for each ATS to monitor all functions specified below.

    a. The meter shall be listed to UL 61010-1, CSA-C22.2 No. 61001-1, 2nd Edition, 2004-07.
    b. The meter shall be accurate to 0.25% Current, Voltage, Power, and Frequency. 1.0% Energy, Power Factor and Demand.
    c. The meter shall be capable of operating without modification at nominal frequencies of 45 to 65 Hz and over a control power input range of 9–36VDC.
    d. Each meter shall be capable of interfacing with a communications module to permit information to be sent to central location for display, analysis, and logging.
    e. The meter shall accept inputs from industry standard instrument trans-formers (120 VAC secondary PTs and 5A secondary CTs.) Direct phase voltage connections, 600 VAC and under, shall be possible without the use of PTs.
    f. The meter shall be applied in single, 3-phase, or three & four wire circuits. A fourth CT input shall be available to measure neutral or ground current.
    g. All setup parameters required by the meter shall be stored in non-volatile memory and retained in the event of a control power interruption.

h. The meter shall be equipped with a continuous duty, long-life, 4 line x 20 character LCD backlit display to provide local access to the following metered quantities:

1) Current, per phase RMS and neutral (if applicable)
2) Current Unbalance %
3) Voltage, phase-to-phase and phase-to-neutral
4) Voltage Unbalance %
5) kW
6) kVA
7) kVAR
8) Power Factor
9) kWh
10) kVAh
11) kVARh
12) Total Harmonic Distortion
13) Utilization
14) kW Demand
15) Engine Run Time
16) Min/Max Historical Values

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources without breaking the load.

C. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.

2. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations.

3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.

4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.

5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.

6. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.

7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

D. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.5 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Division 26 Section "Identification for Electrical Systems."

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.

2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer

switches and of emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

D. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.

c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

E. Coordinate tests with tests of generator and run them concurrently.

F. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

G. Remove and replace malfunctioning units and retest as specified above.

H. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 264113 LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein.
2. The Contractor shall furnish and install a complete lightning protection system with all necessary components for a complete and operational system.

1.3 SYSTEM DESCRIPTION

A. The entire lightning protection system shall be manufactured and installed in accordance with Underwriters Laboratories, Inc. Pamphlet no. UL96A Master Labeled Lightning Protection Systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Isometric and plan views showing layout and connections to the required metal surfaces.
2. Show the methods of mounting the system to the adjacent construction.
3. Qualifications: Submit proof that the installer of the lightning protection system has had suitable and adequate experience installing other lightning protection systems, and is capable of installing the system as recommended by the manufacturer of the equipment.
4. Certification: Two weeks prior to final inspection, submit four copies of the following certifications to the Resident Engineer:

    a. Certification that the lightning protection system has been properly installed and tested.
    b. Certification that the lightning protection system has been inspected by a UL representative and has been approved by UL without variation
    c. Include layouts of the lightning protection system, with details of the components to be used in the installation.
    d. Include raceway locations needed for the installation of conductors.

e. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
f. Include roof attachment details, coordinated with roof installation.
g. Calculations required by NFPA 780 for bonding of metal bodies.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lightning protection cabling attachments to roofing systems and accessories.
2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
4. Lighting protection system coordination with the building grounding system.

B. Qualification Data: For Installer.

C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For lightning protection system to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 017839 "Project Record Documents."
b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.

B. Completion Certificate:

1. UL Master Label Certificate.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: LPI Master Installer.

B. The design of the systems shall be performed by fully qualified personnel having a minimum of five years experience designing these types of systems. They shall have been certified for design by a recognized lightning protection school such as the Lightning Protection Institute.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Warren Lightning Rod Company (design basis)
2. Advanced Lightning Technology, LTD.
3. East Coast Lightning Equipment Inc.
4. ERICO International Corporation.
5. Harger Lightning & Grounding.
6. Preferred Lightning Protection.
7. Thompson Lightning Protection, Inc.
8. Or approved equal.

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for Class I buildings.

B. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

A. Air Terminals:

1. Copper unless otherwise indicated.
2. 5/8-inch diameter with 10” minimum but not more than 24” length.
3. Pointed tip.
4. Integral base support.
5. Wherever materials come in direct contact with aluminum surfaces, the air terminals shall be solid aluminum, ½ inch in diameter.

B. Air Terminal Bracing:

1. Copper.
2. 1/4-inch diameter rod.

C. Class 1 Main Conductors:

1. Stranded Copper: 57,400 circular mils in diameter. Coordinate with final lightning protection system installer shop drawings.

D. Secondary Conductors:

1. Stranded Copper: 26,240 circular mils in diameter. Coordinate with final lightning protection system installer shop drawings.

E. Ground Loop Conductor: Stranded copper**.**

F. Attachments: Fasteners shall be of suitable configuration for the intended application and of the same material as the conductor. Nails, screws, or bolts employed to secure the fasteners shall be of the same material as the fasteners or of material which is as resistant to corrosion as that of the fasteners. (Galvanized or plated steel nails, screws, or bolts are not acceptable).

G. Connections and Splices: Connectors and splices shall be of suitable configuration and type for the intended application and of the same material as the conductor.

H. Ground Rods:

1. Material: Copper-clad steel.
2. Diameter: 3/4 inch.
3. Rods shall be not less than 120 inches long.

I. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

J. Surge Arresters: Provide surge protection/suppression for all incoming utility services including electrical service, telecommunications service, and cable service in accordance with NFPA 780 requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to NFPA 780.

B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches in radius and narrow loops.

C. Conceal conductors within normal view from exterior locations at grade within 200 feet of building. Comply with requirements for concealed systems in NFPA 780.

1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
2. Install conduit where necessary to comply with conductor concealment requirements.
3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.

B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: exothermic weld.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Perform inspections as required to obtain a UL Master Label for system.

B. Prepare test and inspection reports and certificates.

END OF SECTION 264113

SECTION 264313 SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:

1. Section 262413 "Switchboards" for factory-installed SPDs.
2. Section 262416 "Panelboards" for factory-installed SPDs.

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Eaton.

4. General Electric Company.
5. Leviton Manufacturing Co., Inc.
6. Liebert; a brand of Emerson Electric Co.
7. Siemens Industry, Inc.
8. Square D; by Schneider Electric.
9. Or approved equal.

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type .

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
e. Surge counter.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. SCCR: Equal or exceed 200 kA.

G. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Eaton.
4. General Electric Company.
5. Leviton Manufacturing Co., Inc.

6. Liebert; a brand of Emerson Electric Co.
7. Schneider Electric USA, Inc.
8. Siemens Industry, Inc.
9. Square D; by Schneider Electric.
10. Or approved equal.

B. SPDs: Comply with UL 1449, Type 1.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
3. Neutral to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
4. Line to Line: 2000 V for 480Y/277 V and 1200 V for 208Y/120 V

F. SCCR: Equal or exceed 100 kA.

G. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - **EXECUTION**

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 280500 BASIC MATERIALS & METHODS FOR ELECTRONIC SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Requirements of Drawings, General and Supplementary Conditions, Divisions 00 and 01 apply to this section.

1.2 SUMMARY

A. Related sections:

1. Electrical Requirements: Division 26
2. Mechanical Requirements: Division 23

B. Drawings use and interpretation:

1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
2. For exact locations of building elements, refer to dimensioned architectural/structural drawings.
3. Field measurements take precedence over dimensioned drawings.
4. Intention is to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.

C. Installation of all electronic systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.

D. Dimensions indicated are limiting dimensions.

E. Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.

F. Description of systems:

1. Provide materials to provide functioning systems in compliance with performance requirements specified.
2. Provide modifications required by reviewed shop drawings and field coordinated drawings.

G. The work of this division shall consist of, but shall not be limited to, the providing of the following systems:

1. Video Surveillance System: Section 282300
2. Security Management System: Section 285000

1.3 SUBMITTALS

A. Shop drawings:

1. As indicated in each Division 28 section and as indicated herein.
2. Submit for review by the Architect/Engineer, complete engineering data for each system for evaluation of the proposed system with respect to specification requirements. Submittals for each system shall consist of engineering data sheets, schedules, and manufacturer's descriptive catalog sheets for each system component and manufacturer prepared shop drawings to indicate conformance with the contract documents.
   a. Provide complete floor plans. Each plan shall show proposed device locations.
      1) Show actual device nomenclature as illustrated on riser and single line diagrams.
      2) Show pullboxes, equipment enclosures and terminal cabinets.
      3) Show conduits and fill (optional if lateral conduits are shown with size and fill on the riser).
   b. Riser diagram:
      1) Illustrate conduit relationships between devices shown on the floor plans.
      2) (Lateral conduits are optional if shown on the plans).
      3) Show actual device nomenclature as illustrated on the plans and breaker number where the power will be sourced.
   c. Single-line diagrams:
      1) Show signal relationships of devices within the system.
      2) Show actual device nomenclature as illustrated on the riser and plans.
      3) Show wire numbers.
   d. Equipment enclosure wiring diagrams:
      1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
      2) Show the device nomenclatures exactly as shown on the single line diagrams.
      3) Show the terminations including the wire numbers as shown on the single line diagrams.
      4) Show wire colors for each terminal.
      5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
   e. Free standing device wiring diagrams:
      1) For each free standing device, such as a computer, printer or the like, show the rear elevation of the device as a pictorial.
      2) Show the termination connectors on the device.
      3) Show the wire numbers attached to the connectors.
      4) Schedule the wire colors connected to the pins on each device connector.
   f. Custom assembly diagrams:
      1) For each custom assembly such as a receptacle assembly, control panel or the like, provide an assembly drawing illustrating the appearance of the assembled device including dimensions, assembly components and functional attributes (momentary or alternate action switch, lens color, panel finish and the like).

g. Specification comparison:
   1) Copy of specification annotated on line by line basis where proposed product or system differs from specified product or system. Any differences to be explained.

3. When application engineering and submittals have been prepared, a meeting shall be set up with the Architect/Engineer and Owner for preliminary shop drawing review. The project superintendent for the work of this division shall explain the entire system operation, equipment and other items as called for in the specification. Any drawings required shall be submitted one week in advance of proposed meeting date and preliminarily reviewed at this meeting. This meeting will be held in the Owner's jobsite office.
4. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item. Manufacturer description sheets shall have an arrow stamp pointing to each item on the sheet that is intended for review. Each operational feature of the systems included shall be addressed in narrative form and relate to specific system requirements described in the plans and specifications. All drawing submittals shall be submitted on same size sheets, identified by system, and sequentially numbered throughout the entire set.
5. Submittals shall be made for each of the systems being supplied for the project.
6. All shop drawings required shall be submitted at the same time in one packaged submittal.
7. Provide on drawings 30" x 42" size.

B. Product data:

1. Product list for Division 28 equipment.
2. As indicated in each Division 28 section and as indicated herein.
3. Description of system operation indicating overall system operation and purpose and capabilities of each component within system.
4. Cross reference data sheets to components shown on system/riser diagrams.

C. Samples:

1. As indicated in each Division 28 section.

D. Project information:

1. As indicated in each Division 28 section.

E. Contract closeout information:

1. As indicated in each Division 28 section.

F. Record drawings:

1. Keep a complete set of all electronic systems drawings in job site office for showing actual installation of electronic systems and equipment.

Drawings shall show location and routing of conduit and cable.

2. Use this set of drawings for no other purpose.
3. Where any material, equipment, or system components are installed differently from that shown, indicate differences clearly and neatly using ink or indelible pencil.
4. At project completion, submit record set of drawings to Construction Manager for review and distribution to the Owner.

1.4 OPERATION AND MAINTENANCE DATA

A. At the time of final inspection, provide four sets of complete data on electronic security and communication equipment used in this project. This data shall be in bound form and shall include all shop drawings required for this project.

B. Operation and Maintenance Data for the electronic systems shall include layout drawings of each panel with each item of equipment identified and cross referenced with equipment data sheet. Operation and Maintenance Data shall include complete terminal block schedule for each panel with the following data for each point:

1. Type of point, i.e., input, output, etc.
2. Schedule relating points, terminal block numbers, and signal source or destination.
3. Input and output schedule.
4. Location and type of input source device.
5. Location and type of output device controlled.
6. Project-specific, illustrated user's manual.
7. Provide detailed electrical schematics for all electrical/electronic components.

C. All Operation and Maintenance Data shall include "record drawing" system interconnection diagrams with major components identified and number and type of interconnecting conductors. Submit two copies and one sepia of each record drawing.

1. Floor plan drawings shall be provided showing location of equipment and routing of conduit and cable.

D. Maintenance and operating instructions on all systems.

E. Control wiring diagrams for all locking systems with each system identified.

F. Certification from system manufacturers that systems are installed in accordance with manufacturer's recommendations and are functioning

correctly at the time of final inspection.

1.5 QUALITY ASSURANCE

A. Perform all work in accord with following codes:

1. Federal, state and local codes, regulations and ordinances
2. Underwriter's (UL) code requirements
3. NFPA 70 National Electrical Code (NEC) (Latest Edition).
4. Occupational Safety and Health Act (OSHA).
5. All authorities having jurisdiction
6. Factory Mutual System (FM) requirements
7. NFPA 101: Life safety code.
8. ANSI-All7.1: Handicap code, Chapter 553- Part V
9. International Building Code, New Jersey Edition (Latest adopted Edition)
10. American's with Disabilities Act (ADA)

B. The intent of these specifications is to ensure the systems described in this division are provided and installed by a technically experienced installer and, further, that the work is fully coordinated between the various systems by a single installer who is technically qualified as described herein.

C. Where the installer is a branch office or other division of a larger organization, the qualifications of the branch office or other division shall meet the requirements of the Contract Documents. The installer incorporated under the same name, shall have successfully completed a minimum of three similar correctional construction projects, both in scope and system types.

D. The work of this division shall be managed and supervised by a full-time site project superintendent who shall have the following qualifications:

1. Experience in the applications engineering, installation, and supervision of similar construction projects both in scope and system type for a minimum of 5 years.
2. Full time employee of the installer.
3. Have a working knowledge of all systems installed under this division.
4. Project superintendent shall be on site full time through duration of construction.

E. Acceptable installers: Subject to their adherence to these specifications, the following are pre-qualified to perform the access control systems installation/integration work of this section:

1. Siemens
2. Kratos

F. Project Conditions:

1. Examine Contract Documents to determine how other work will affect execution of electronic systems work.
2. Make arrangements for and pay for necessary permits, licenses, and inspections.
3. Determine and verify locations of all existing utilities on or near site.
4. Provide covering and shielding for all equipment to protect from damage.
5. Repair, restore or replace damaged, corroded and rejected items.
6. Include provisions for inclusion of prevailing wage requirements

1.6 OWNER'S TRAINING

A. Include all costs required to:

1. Train operation and maintenance personnel in use and maintenance of systems provided under this section.
2. Train maintenance staff in troubleshooting and maintenance of each system
3. Provide copies of technical manuals, including functional/operational circuit characteristics and schematic diagrams, for each system and system component.

B. Training sessions shall be conducted by instructors certified in writing by manufacturer of specific system.

1. Conduct sessions for not less than four hour periods during normal working hours, i.e., Monday through Friday, 8:00AM to 5:00PM.
2. Training session schedules shall conform to requirements of Owner.
3. Submit schedules to Owner for approval not less than two weeks prior to training session.
4. Do not schedule training sessions for different systems concurrently.
5. Training hours shall be cumulative of hours specified in each section.
6. Provide a minimum of 40 hours of training to be apportioned between systems.

C. Instruct operating staff in proper operation, including hands-on training.

D. Video record all training sessions including but not limited to classroom training, operational training and hands on training.

1. Provide two interactive DVD copies of recorded training material to Owner.

1.7 EXTRA MATERIALS

A. Furnish spare parts as required in each section.
B. All spare parts shall be new and in original packaging from manufacturer.
C. Insure parts are package to protect from damage and to allow for easy storage.
D. Provide inventory of all spare parts.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:

1. Individual items:
   a. Base:
      1) As noted in each Division 28 section.
   b. Optional: As noted in each Division 28 section.

B. Use only prime quality, new materials, apparatus and equipment.

C. Use UL labeled electrical materials where listing has been established for materials or devices in question.

D. Structural steel for supports: ASTM-A36/A36M.

1. Galvanize members installed in areas of high humidity or condensation.
2. Furnish other members with shop coat of rust inhibiting primer.
3. Shop fabricate for field assembly using bolts.
4. Minimize field welding.
5. Retouch primer and galvanizing after field welding.

E. Access doors, panels and frames.

1. Style and type required for material in which installed.
2. Provide in walls, floors, and ceilings to permit access to all equipment requiring service, adjustment or inspection. Include any location where splicing occurs.

2.2 WEATHER PROOF EQUIPMENT

A. Use weatherproof (WP) enclosures for all exterior devices and equipment

2.3 LIGHTNING PROTECTION (TRANSIENT VOLTAGE SURGE SUPPRESSION-TVSS)

A. Acceptable manufacturers:

1. Transient voltage surge protection:
   a. Base:
      1) Northern Technologies
   b. Optional:
      1) Transtector systems
      2) Leviton

c. Indicate on shop drawings locations of all transient voltage surge protection devices.

2. All TVSS devices shall be provided by one manufacturer.
3. TVSS manufacturer shall have a company-wide quality program and be ISO 9001 certified by an accredited organization.

B. Protect all communication, video, and data equipment against surges induced on all control, communication, video, sensor and data cables. All cables and conductors which serve as control, sensor, audio, or data conductors which leave the building (including devices mounted on building exterior) shall have surge protection circuits installed that meet the IEEE 472 surge withstand capability test and the electrical transient tests as established in UL 365-1985. Fuses shall not be used for surge protection.

C. Lightning protection devices for protection of control, sensor, audio, and data cabling shall be located as recommended by the manufacturer.

D. All control, communications, video, sensor, and data cables connected to lightning protection devices shall be isolated from all other building internal and external wiring, and shall not occupy the same raceway, junction boxes, or wireways.

E. All systems and components as specified herein shall be equipped with lightning protection devices, installed as described herein.

F. All power connections, including 24VDC and 24VAC power supplies and direct wired or plug- in 120VAC power connections, for all systems and components as specified herein, shall be equipped with lightning suppression devices. All communication, data and power lightning protection devices shall be bonded to building grounding system in accordance with Article 250 of the National Electrical Code.

G. Communication, data and signal:

1. Shall incorporate Silicon Avalanche Diode devices as the primary protection means.
2. Shall have a surge life of at least 10 operations for 10,000 amps, 8 x 20 microsecond wave.
3. Shall have an initial clamping voltage suitable to the application and shall not exceed 200 percent of the peak signal voltage rating of the circuit.
4. Shall have a peak clamping voltage suitable to the application and shall not exceed 300 percent of the peak signal voltage rating of the circuit.
5. Shall be selected as required for the particular data frequencies and signal level characteristics of the application.

H. Branch power circuits:

1. Shall incorporate Silicon Avalanche Diode devices as the primary protection means.
2. Shall have a surge life of at least 200 operations for 3,000 amps, 8 x 20 microsecond wave for 120V single phase application.
3. Shall have a maximum single surge capacity of at least 19,000 amps for 8 x 20 microsecond wave.
4. Shall have an initial clamping voltage of no greater than 250V (location category B, 500A) for 120V single phase application.

5. Shall have a peak clamping voltage of not greater than 500V (location category B, 500A) for 120V single phase application

I. Video coaxial lines:

1. Shall incorporate silicon avalanche diode devices as the primary protection means.
2. Shall have a surge life of at least 10 operations for 10,000 amps, 8 x 20 microsecond wave.
3. Shall have an initial clamping voltage suitable to the application and shall not exceed 200 percent of the peak signal voltage rating of the circuit.
4. Shall have a peak clamping voltage suitable to the application and shall not exceed 30V.
5. Shall be selected as required for the particular data frequency and signal level characteristics of the application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use only thorough, highly skilled, and experienced workers.

B. When changes in location of any work are required, obtain approval of Architect/Engineer prior to making change.

1. Make changes at no extra cost to Owner.

C. Provide access panels (detention and non-detention) in any area where equipment is located which requires accessibility for service and/or maintenance.

D. Do not change indicated sizes or configuration without written approval of Architect/Engineer.

E. Provide to Division 26 subcontractor all non-standard electrical boxes related to Division 28 scope of work.

F. Work provided by Division 26.
1. Complete conduit/ raceway system from the main head end equipment to the end field device, including any necessary standard size backboxes, equipment room wireways, system pullboxes and access panels.
2. 208 volt AC wiring and connections to UPS equipment.
3. Division 28: subcontractor shall submit conduit requirements and special backboxes for work to be performed by Division 26 subcontractor in a timely manner so as not to impede the progress of the work.
4. Division 28: subcontractor shall provide information to Division 26 subcontractor for any additional conduits required or increase in size of conduit to effect the installation of the electronic systems contained herein. Costs of additional conduits or size increase shall be the responsibility of the Division 28 subcontractor.
5. Division 28: subcontractor shall be responsible for 120 volt AC wiring and connections from the output of UPS distribution panel to all required Division 28 equipment including required connections.

G. Fill percentage: Conduit fill shall not exceed 40 percent.

H. Conduit verification:

1. Verify that all conduit is clear of foreign matter and substances prior to pulling of wire or cable.
2. Apply a chemically inert conduit lubricant to all wire and cable prior to pulling. Do not subject wire and cable to tension greater than recommended by the manufacturer. Under no circumstances shall wire or cable be "jerked", "yanked" or attached to any mechanical pulling device which exerts excessive force; shear or tensile.
3. Secure all wire and cable runs vertically in conduit for continuous distances greater than thirty (30) feet at the vertical run terminations. Non-coaxial cables shall be secured by screw-flange nylon cable ties or similar devices. Symmetrical clamping devices with split, circular or other wire conforming, non-metallic bushings shall be provided for all other cables.

I. Provide conductors, control and communications cables, coaxial cables, etc., for the work of this division.

J. Division 28 systems (i.e., communications, door control, CCTV, access control, power) shall not occupy the same conduit/raceway.

K. Provide installation, including electrical connections, cable pulling, testing and interfacing of systems.

L. Deliver materials and equipment to project and store in original containers or cartons, properly protected from elements.

M. Store items subject to moisture or temperature damage in dry, temperature controlled spaces.

N. Execute all work described in this specification and shown on drawings and all work dependent upon, and necessary to, complete finish of the work so described or shown, in a workmanlike manner using materials best adapted to purposes where such work or material is not specifically mentioned.

3.2 CUTTING AND PATCHING

A. Provide cutting, fitting, repairing, patching and finishing of installed work.

1. Include installed work of other sections where it is necessary to disturb such work to permit installation of electronic systems work.
2. Repair or replace existing or new work disturbed.

B. Avoid cutting, where possible, by setting sleeves or frames, and by requesting openings in advance.

C. Before cutting, obtain approval of Architect/Engineer.

1. Use only approved methods.

2. Cut all holes neatly and as small as possible to admit work.
3. Do not weaken walls or floors; locate holes in concrete to miss structural sections.

D. Locate openings and sleeves to permit neat installation of conduits and equipment.

E. Do not remove or damage fireproofing materials.

1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
2. Repair or replace fireproofing removed or damaged, at no extra cost.

3.3 COORDINATION

A. General:

1. Coordinate the work with the other trades to assure that where this work interfaces to other trades, those interfaces are provided, complete and functional.
2. Verify all field conditions.
3. Positioning Members: Provide additional support or positioning members as required for the proper installation and operation of equipment, materials and devices provided as part of this work as approved by the Architect or Owner without additional expense.
4. Interface Devices: Provide all items necessary to complete this work in conformance with the Contract Documents or the satisfaction of the Owner without any additional expense.

3.4 INSTALLATION OF EQUIPMENT

A. Install all equipment in accord with manufacturer's recommendations.

B. Provide all necessary anchoring devices and supports.

1. Use structural supports suitable for equipment.
2. Check loadings and dimensions of equipment with shop drawings.
3. Do not cut, or weld to, building structural members.

C. Verify that equipment will fit support layouts indicated.

1. Where substitute equipment is used, revise indicated supports to fit at no additional cost

D. Installation of security electronics headend equipment shall not proceed until the progress of construction has reached the following status in the area of installation:

1. Temperature and humidity are controlled.
2. Finished ceiling, if any, is installed.
3. Walls are finish coated with final paint treatment.
4. Floors are finished and sealed.

E. Installation of security electronics control room equipment shall not proceed until the progress of construction has reached the following status in the area of installation:

1. Temperature and humidity are controlled.
2. Finished ceiling, if any, is installed.
3. Walls are finish coated with final paint treatment.
4. Floors are finished and sealed.
5. Millwork is completely installed, approved and signed off.

F. Equipment installed in areas where the previously described conditions have not been met and maintained after equipment installation shall be removed and either cleaned or replaced at the Architect/Engineer's discretion.

G. Install equipment to permit easy access for normal maintenance.

1. Maintain easy access to switches, pull boxes, panels, receptacles, etc.
2. Relocate items which interfere with access.

3.5 WIRING

A. All wiring:

1. Point to point with appropriate terminal connections for every wire and component termination.
2. All connections mechanically secure.
3. Clearly identify, label and tag all wiring and terminals at each junction box and each terminal end to facilitate installation and maintenance, as well as cross referenced to O&M manuals.
4. Terminate all stranded wire with solderless, crimp on, insulated terminals properly sized for gauge and type wire and screw terminal.
   a. Identify all wire and cable clearly with permanent labels (wire tags) wrapped around the full circumference at least twice within 1 IN of each connection. Indicate the number designated on the associated shop or field drawings or run sheet, as applies. Assign wire or cable designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
5. All wiring shall be color coded. Power circuits shall be color coded in accordance with NEC requirements. Lock wiring shall be color coded to match locking device color code where possible.
6. Wiring of different systems shall not be placed in the same conduit.

B. All cable and wire:

1. Standard type available from more than one cable manufacturer.
2. Manufacturer and installer are responsible for system performance.

C. All cabling, wiring, conduits/raceways and equipment housings: In strict accordance with recommendations of equipment manufacturer; finish and color of all face plates as directed by Architect/Engineer.

D. Furnish and install all wiring and cable for electronic systems, and perform all

connections and equipment terminations.

1. Check each cabling system run thoroughly for opens, shorts, faults, and other discontinuities.
2. Test each system receptacle for continuity, ground condition, and voltage level prior to allowing plug-in of system equipment.
3. All conductors from outgoing terminal blocks in control consoles, panels and/or systems equipment cabinets to devices controlled to be continuous.
   a. No splicing of conductors allowed.
4. Field device terminations to be per manufacturer's requirements.
   a. Conductor to conductor connections to be fully insulated crimp on male/female tab type or pin and sleeve type.
   b. No conical spring connectors to be used.

E. Install electronic systems wiring in conduit 3/4 IN minimum, unless otherwise indicated.

F. Conductors:

1. All conductors to be stranded.
2. 120 VAC and power supply connections: Minimum 12 GA, 600V insulation.
3. 120 VAC and 24 VAC door power circuits: Minimum 14 GA, 600V insulation.
4. Class 1, remote control and signaling circuits: Minimum 18 GA, 600 volt insulation.
5. Class 2, remote control and signaling circuits: Minimum 20 GA, 300 volt insulation.
6. Use larger wire size when recommended by equipment manufacturer or required for voltage drop.
7. All communications wire to be rated for minimum 300 volt.
8. Provide ground wire to all electric motor driven or solenoid locks with a rated voltage greater than 30 volts.
9. All audio cable shielded.
10. All data cable shielded.

G. Wire lacing and dressing:

1. Lace, tie or harness wire and cable vertically, horizontally and at right angles to the enclosure surfaces as required herein and in accordance with accepted professional practice. Provide service loops where harnesses of different classes cross or where hinged panels are to be interconnected.
2. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point.

H. Boxes: Provide a 6 IN loop for all wire and cable routed through pull boxes or distribution panels. Cable loops and bends shall not be at a radius smaller than that recommended by the manufacturer. Enlarge pull boxes as necessary to accommodate this requirement.

I. Wiring practices:

1. Non-coaxial connections: Make all non-coaxial connections (except microphone or line level) to screw-type barrier blocks with insulated crimp-type spade lugs or Kulka 3700 type barrier blocks. Use of rail mount compression terminals is

allowable. Size all lugs properly to assure high electrical integrity, i.e., low resistance connections. Connect only one (1) wire per spade lug and not more than two (2) lugs per screw terminal. No "free" (i.e., stak-on) splices are acceptable. Wire nuts and/or electrical tape connection are absolutely forbidden.

3.6 F1ELD QUALITY CONTROL

A. Perform indicated tests to demonstrate workmanship, operation, and performance.

1. Conduct tests in presence of Architect/Engineer, Owner and, if required inspectors of agencies having jurisdiction.
2. Arrange date of tests in advance with Architect/Engineer, manufacturer and installer.
3. Give minimum of 1 week notice to all inspectors.
4. Furnish or arrange for use of electrical energy, steam, water, diesel fuel, or gas required for tests.

B. Repair or replace equipment and systems found inoperative or defective and retest.

1. If equipment or system fails retest, replace it with products conforming with Contract Documents.
2. Continue remedial measures and retests until satisfactory results are obtained.

C. Test equipment and systems as indicated for each item, unless otherwise recommended by manufacturer.

3.7 SYSTEMS OPERATIONAL TESTS

A. Prior to the time of substantial completion, an operational test, witnessed by a representative of the Architect/Engineer and Owner, shall be held of each system comprising the total electronic system to determine full compliance with the contract drawings. Provide all personnel, equipment, instrumentation and communication equipment and include all costs of testing in the contract.

B. The installer/integrator shall certify in writing that the systems are installed in compliance with the manufacturer's recommendations, comply with the requirements of the contract documents and are operating correctly. These written certifications shall be submitted to the Architect/Engineer and shall signify that the total electronic system is operationally tested and ready for final acceptance testing by the Architect/Engineer.

C. Final acceptance tests of the total electronic systems shall be conducted as directed by the Architect/Engineer but generally described as follows:

1. Locking system shall be tested by operation of each individual locking device with status visual display observed.
2. Remote control and emergency release of locking systems shall also be tested.
3. Intercom system shall be tested by operation of all individual features and stations.
4. Each individual alarm system and each group of alarm systems operating both individually and collectively shall be tested for alarm signal initiation, tamper signal initiation and loss of power signal initiation as directed by the Architect/Engineer.

D. It shall be the responsibility of the Integrator to submit for the Architect/Engineer's approval, a proposed systems check list for use in final acceptance testing. This checklist shall consist of a list of individual tasks on a device-by-device basis, organized into logical groups per system being supplied. The checklist shall be submitted not later than 90 days prior to the scheduled start of acceptance testing. Acceptance testing may not begin until the Architect/Engineer has approved the form and content of the acceptance checklist.

3.8 ADJUST AND CLEAN

A. Inspect all equipment and put in good working order

B. Clean all exposed and concealed items.

C. All equipment shall be clean and dust free.

3.9 PUTTING SYSTEMS IN OPERATION- START UP

A. Put all systems into satisfactory operation prior to final acceptance, at time agreed to by Owner and Architect/Engineer.
B. Operate all systems in good working order for period of 10 working days prior to final acceptance testing.

3.10 DEVICE MOUNTING SCHEDULE

A. Dimensions are to center of device unless otherwise indicated. Coordinate outlet locations with all architectural millwork, hollow metal and/or casework elevations. Coordinate device mounting height with wainscoting where provided. Where top of wainscot and device mounting height overlaps, shift device down to provide 2 IN gap between top of device and top of wainscot.

B. Mounting heights as indicated below:

1. Speaker volume control: 48 IN, AFF
2. Duress pushbutton (wall mounted): 48 IN, AFF
3. Intercom call button: 48 IN, AFF or as noted
4. Door control release pushbutton: 48 IN, AFF or as noted
5. Intercom flush wall station: 48 IN, AFF

3.11 LABELING

A. Labeling:

1. Engraved phenolic nameplates for security equipment cabinets, and enclosures.
2. Label all junction boxes using black permanent ink with type of system wiring installed in junction box, i.e., access control, detention door controls, intercom, CCTV, etc.

END OF SECTION 28**0500**

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. 62.5/125-micrometer, multimode optical fiber cabling.
3. RS-232 cabling.
4. RS-485 cabling.
5. Low-voltage control cabling.
6. Control-circuit conductors.
7. Fire alarm wire and cable.
8. Identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

F. RCDD: Registered Communications Distribution Designer.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.8 FIELD CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, with fire retardant black paint: 3/4 by 48 by 96 inches.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Superior Essex Inc.
2. Berk-Tek; a Nexans company.
3. SYSTIMAX Solutions; a CommScope, Inc. brand.
4. Or Approved Equal.

B. Description: 100-ohm, four-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with ANSI/TIA-568-C.1 for performance specifications.
3. Comply with ANSI/TIA-568-C.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

1) Superior Essex DataGain® Category 6+ or Approved Equal
a. Part # 66-246-XB (X=Color)

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Leviton Network Solutions

2. Ortronics
3. SYSTIMAX Solutions; a CommScope, Inc. brand.
4. Or Approved Equal.

B. General Requirements for Cable Connecting Hardware: Comply with ANSI/TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cable

1. Leviton 110 Style Flat Panels or Approved Equal
   (a) 24 Port - Part # 69586-U24
   (b) 48 Port - Part # 69586-U48

D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

1. Leviton extreme® 6+ CAT 6 Connector with / RFT or Approved equal.
   Part # 61110-R*6 (*=Color)

E. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

   a. Leviton SlimLine UTP Patch Cord with Matching Boot or Approved equal
      Part # 6D460-xx* (xx=Length,*=Color)

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Superior Essex Inc.
2. Berk-Tek; a Nexans company.
3. SYSTIMAX Solutions; a CommScope, Inc. brand.
4. Or Approved Equal.

B. Description: Multimode, 62.5/125-micrometer, 24-fiber,tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.

2. Comply with ANSI/TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAC for detailed specifications.
4. Conductive cable shall be steel armored type.
5. Maximum attenuation dB/Km @ 850/1300 nm: 3.5/1.5
6. Minimum overfilled modal bandwidth: 500 MHz-km @ 850 nm.
7. Minimum overfilled modal bandwidth: 500 MHz-km @ 1300 nm

8. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

   a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

      1) Superior Essex OM3 Plenum Armored Fiber
      Part # LXXXB401 (XXX=Strand Count)

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Leviton Network Solutions.
2. Berk-Tek; a Nexans company.
3. SYSTIMAX Solutions; a CommScope, Inc. brand.
4. Or Approved equal.

B. Cable Connecting Hardware: Meet the Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA-604-12. Comply with ANSI/TIA-568-C.3.

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA-604-12. Comply with ANSI/TIA-568-C.3.
2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
   a. Leviton FASTCAM LC LOMM Connector Aqua or Approved Equal
   Part #49991-5LC

2.7 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.8 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.9 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.10 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.11 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Comtran Corporation.
2. Genesis Cable Products; Honeywell International, Inc.
3. West Penn Wire.
4. Or approved equal.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.12 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Worldwide, Inc.
2. HellermannTyton North America.
3. Kroy LLC.
4. Or approved equal.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.13 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to ANSI/TIA-568-C.1.

C. Factory test UTP cables according to ANSI/TIA-568-C.2.

D. Factory test multimode optical fiber cables according to TIA-526-14-A and ANSI/TIA-568-C.3.

E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

A. Install wiring in metal pathways and wireways.

1. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

2. Comply with requirements in Section 280528 "Pathways for Electronic Safety and Security."

B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with ANSI/TIA-568-C.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.

1. Comply with ANSI/TIA-568-C.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

E. Optical Fiber Cable Installation:

1. Comply with ANSI/TIA-568-C.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

F. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Section 260533 "Raceways and Boxes for Electrical Systems."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is[**not**] permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

A. Comply with requirements in Section 281300 "Access Control" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Section 282300 "Video Surveillance" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Section 285000 "Security Management Systems" for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

A. For communications wiring, comply with J-STD-607-B and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with ANSI-TIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with ANSI/TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

    a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in ANSI/TIA-568-C.1.

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.

1.3 DEFINITIONS

A. Signal Ground: The ground reference point designated by manufacturer of the system that is considered to have zero voltage.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harger Lightning and Grounding.
2. Panduit Corp.
3. Tyco Electronics Corp.
4. Or approved Equal.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Chatsworth Products, Inc.
3. Harger Lightning and Grounding.
4. Panduit Corp.
5. Tyco Electronics Corp.
6. Or approved equal.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding.
3. Panduit Corp.
4. Or approved equal

B. Grounding Busbars: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch separation from wall.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches stainless-steel or copper-plated hardware for attachment to the rack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
2. Bond shields and drain conductors to ground at only one point in each circuit.

B. Signal Ground:

1. For each system, establish the signal ground and label that location as such.
2. Bond the signal ground to the alternating-current (ac) power system service by connecting to one of the following listed locations, using insulated No. 6 AWG, stranded, Type THHN wire:

    a. Grounding bar in an electrical power panelboard if located in the same room or space as the signal ground.
    b. Telecommunications grounding busbar.

C. Comply with NECA 1.

3.2 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.

3.3 CONNECTIONS

A. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

B. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

C. Shielded Cable: Bond the shield of shielded cable to the signal ground. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.

D. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 280526

SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Optical-fiber-cable pathways and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface pathways.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.
2. Section 270528 "Pathways for Communications Systems" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving communications systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways and surface pathways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, and equipment racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube & Conduit.
2. Anamet Electrical, Inc.
3. O-Z/Gedney.
4. Republic Conduit.
5. Robroy Industries.
6. Southwire Company.
7. Thomas & Betts Corporation.
8. Wheatland Tube Company.
9. Or approved equal.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. Arnco Corporation.
3. Endot Industries Inc.
4. IPEX.
5. Lamson & Sessions; Carlon Electrical Products.
6. Or approved equal.

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.
5. Or approved equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Mono-Systems, Inc.
b. Niedax-Kleinhuis USA, Inc.
c. Panduit Corp.
d. Wiremold / Legrand.

e. Or approved equal.

C. Tele-Power Poles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.
d. Or approved equal.

2. Material: Galvanized steel with ivory baked-enamel finish.
3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. EGS/Appleton Electric.
3. Hoffman.
4. Lamson & Sessions; Carlon Electrical Products.
5. O-Z/Gedney.
6. RACO; Hubbell.
7. Robroy Industries.
8. Spring City Electrical Manufacturing Company.
9. Thomas & Betts Corporation.
10. Wiremold / Legrand.
11. Or approved equal

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Device Box Dimensions: 4-inches square by 2-1/8 inches deep.

J. Gangable boxes are allowed.

K. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 or Type 3R, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with TIA-569-B.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Oldcastle Precast, Inc; Christy Concrete Products.
    c. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
    d. Synertech Moulded Products.
    e. Or approved equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "SECURITY".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Loading area.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric-Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway.
8. Pathways for Concealed General Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

M. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

P. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

Q. Surface Pathways:

1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch radius control at bend points.

3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

S. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

T. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 280528

SECTION 280544 - SLEEVES AND SLEEVE SEALS FOR ELECTRONIC SAFETY AND SECURITY PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
2. Penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized-steel sheet.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.
f. Or approved equal

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Presealed Systems.
    b. Or approved equal.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance..
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 280544

SECTION 28 13 00 SECURITY AND COMMUNICATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Integrated security and communication system.

1.2 REFERENCES

A. ISO 9001:2008 – Quality Management Systems – Requirements.

B. TIA/EIA 568 – Commercial Building Telecommunications Cabling Standard.

1.3 SYSTEM DESCRIPTION

A. Components:
1. Door stations.
2. Master Stations: Connect a maximum of seven 16-call add-on selectors Model AX- 16SW.
3. Central Exchange Units (CEU): Connect a maximum of 3 add-on exchange units Model AX-320C.
4. Power supply.
5. Other External Connections:
    a. Access control system.
    b. CCTV system.
    c. CO line adaptor.
    d. Video output.
    e. PC.

B. Capacities:
1. Door Stations: Maximum 120 stations with 1 CEU Model AX-248C and 3 add-on exchange units Model AX-320C.
2. Master Stations:
    a. Maximum 4 stations with CEU Model AX-084C.
    b. Maximum 8 stations with CEU Model AX-248C.
3. Power Supply:
    a. Model PS-2420UL: 24 V DC, 2 A.
    b. For Audio: 1.
    c. For Video: 2.
4. Number of Talk Paths: 2.
5. Number of Video Paths: 2.
6. All Call: 1, to master stations only.
7. Video Monitor: 2, same as talk paths and video paths.
8. Scan Monitor: 1.

C. Calling Master Station from Door Station and Communicating:
1. Priority Levels for Calls from Door Stations:

a. Normal.

b. Priority.

2. Press door station CALL button.
3. Calling tone rings on master station (for normal call, intermittent tremolo sound; for priority call, rapid intermittent tremolo sound) and selector button LED for individual door station flashes (double-flash for priority call). If door station has camera, video from door station shall be displayed on master station monitor. Call tone continues to ring until answered or is timed out (based on setting). You can stop calling tone by pressing OFF button.
4. If you press individual door station selector button, LED stops flashing and stays lit and you can talk hands-free to that station. If only TALK button is pressed to answer call, hands-free communication initiates with door station at highest priority call. Talk LED lights when you talk and goes off as you listen to caller.
5. Press OFF button again to end communication. Call also ends automatically when set talk limit is reached.
6. If you hold down TALK button for a minimum of 1 second, communication switches to press-to-talk mode. Hold down TALK button to talk and release to listen to caller. You cannot switch back from press-to-talk communication to hands-free communication.
7. If other master station presses selector button of in-use door station or in-use master station, busy signal is heard at master station.
8. Microphone is muted while you hold down privacy button on master station while in communication.
9. You can connect footswitch and use it the same manner as TALK button.
10. Master station can display calls up to 8 stations at the same time. If there are more than 8 incoming calls, they will be displayed in order of priority and time of call.
11. You can adjust calling tone, transmit volume, and receive volume with volume controls at bottom of master station.
12. You can use a headset (not included in system) instead of built-in master station's speaker and microphone.

D. Calling Master Station from Another Master Station and Communicating:
1. Press individual selector button of master station.
2. Pre-tone sounds both master stations and starts hands-free communication. Talk LED lights when you talk and goes off as you listen to caller.
3. Press OFF button to end communication. You can end call from either master station. Call also ends automatically when set communication end time is reached.
4. If called master station has privacy mode set (privacy settings button is lit), communication is only 1-way, from calling master station to called master station, and nothing can be heard from called master side. Press TALK button on called master station for a minimum of 1 second. Press-to-talk communication starts. Hold down TALK button to talk and release to listen to caller.
5. You cannot call master station while it is communicating. You will hear a busy signal.

E. Privacy (PRIV) Function:
1. To make master into privacy mode (prevent monitoring from other stations), press privacy button (LED lights up).
2. To cancel privacy mode, press privacy button again (LED goes out).
3. Privacy setting cannot be changed while in communication.

F. CO Line Call from Door Station and Communication:

1. If CALL button is pressed at door station while CO Transfer feature is set (with CO

Transfer button lit), call tone rings on master station (for normal call, intermittent tremolo sound; for priority call, rapid intermittent tremolo sound) and selector button LED for individual door station flashes (double-flash for priority call). At same time, telephone call is placed to programmed CO line number.

2. You can communicate with door station from telephone.
3. You can end communication at telephone. Communication also ends automatically when set talk time limit is reached. About 10 seconds before end of call, you will hear alarm sound on telephone.
4. Maximum duration for CO line call is 300 seconds, even if call timer is set to "Infinite".
5. Using this function requires Viking Electronics, Inc. "K-1900-5 Hot-Line Pulse Dialer".
6. If there are multiple calls, call from door station with highest call priority is transferred.
7. Answering at any master station during CO transfer feature will stop CO transfer.
8. There are no functions, such as for door release and dial-in, from telephone.

G. All Call (Normal Master Station Paging):
1. When you press ALL CALL button on master station, all individual master station selector button LEDs flash slowly. You can clear undesired master station from All Call by pressing individual master station selector button with flashing LED, which will turn off LED. Pressing that button again makes that master station part of All Call again and makes LED flash.
2. If you press TALK button, send LED lights up and all individual master station selector buttons stop flashing and stay lit. Pre-tone sounds on target master stations and they can be talked to. At this time, you cannot hear audio from other master stations.
3. Press OFF button to end. You can end call for individual master station by pressing its OFF button.
4. All Call announcements do not go to master stations that are in use.
5. During All Call, if you press individual master station selector button on calling master station or press individual master station selector button or TALK button on 1 of the other master stations, communications switch to hands-free between master stations.
6. There is no function for hands-free reply from called master station during All Call mode.
7. If you press down ALL CALL button but do not start talking within 30 seconds, system goes back to standby mode. You can also return to standby by pressing OFF button.

H. All Call (Priority Master Station Paging):
1. When you press ALL CALL button on master station, all individual master station selector button LEDs flash slowly.
2. If you press ALL CALL button again, flash rate increases. You can clear undesired master station from All Call by pressing individual master station selector button with flashing LED, which will turn off LED. Pressing that button again makes that master station part of All Call again and makes LED flash.
3. If you press TALK button, TALK LED lights up and all individual master station selector buttons stop flashing and stay lit. Pre-tone sounds on all master stations and all can be called. At this time, you cannot hear audio from other master stations.
4. Press OFF button to end. You can end call for individual master station by pressing its OFF button.
5. Communication of master station being used is cancelled and All Call takes priority. Before communication of master station being used is cancelled, you hear cancel warning sound.
6. During All Call, if you press an individual master station selector button on calling master station or press individual master station selector button or TALK button on one of the other master stations, communications switch to hands-free between those two master stations.There is no function for talk back from

master station receiving an All Call announcement.

7. If you press down ALL CALL button but do not start talking within 30 seconds, system goes back to standby mode. You can also return to standby by pressing OFF button.

I. Monitor:
   1. If you press individual door station selector button, you can hear audio and if that door station has a camera, you can see image.
   2. Press OFF button to end. Call also ends automatically when set communication end time is reached.
   3. While door station is communicating with or monitored by a master station, you cannot monitor that door station from another master station.
   4. If you press TALK button while monitoring, hands-free communication mode starts with that door station.

J. Scan Monitor:
   1. When scan monitor button is pressed, door stations that have been enabled for "Scan Monitor" in programming can be monitored sequentially for a specified time interval (configured in programming).
   2. Monitoring always initiates from target door station with lowest number.
   3. If you press scan monitor button while individually monitoring target door station, monitoring starts with the next door station in line.
   4. If you press scan monitor button while monitoring non-target door station, monitoring starts with the first door station enabled for scan monitoring.
   5. Press OFF button to end.
   6. Communication/video channel 2 is always used for scan monitoring. During scan monitoring, video signal is always outputted from video output port 2 (V2). Scan monitoring is not possible when communication/video channel 2 is being used, even if busy LED is not illuminated.
   7. Only one master station at a time can perform scan monitoring.
   8. If you press TALK button during scan monitoring, hands-free communication mode starts with that door station.
   9. If you press individual door station selector button or scan monitor button during scan monitoring, monitoring switches to monitoring individual door station.
   10. If master station receives call from door station during scan monitoring, scan monitor function ends automatically and shall be restarted manually.
   11. Scan monitoring continues without limit until it is cancelled, but master station LCD monitor goes out after 10 minutes. Outside video output continues even with LCD off. If you press scan monitor button with LCD off, LCD lights up again.
   12. If you press TALK button during scan monitoring, communication mode starts with door station being monitored.

K. Activating Door Release:
   1. Press door release button during communication or monitoring with door station.
   2. Door release function will be activated, releasing door lock.
   3. You cannot operate door from outside telephone.
   4. LED stays lit while door release function is activated.
   5. Door release contacts can be set to Normally Open or Normally Closed via program configuration.

L. Priority:

1. Calls have priority based on the time the call was initiated. (Earlier call has priority over later call).
2. Communication Priority, from Highest to Lowest:
   a. Door station, telephone line communication.
   b. Priority All Call.
   c. Door station to master station communication.
   d. Master station to master station communication.
   e. Normal All Call.
   f. Monitor.
   g. Scan monitor.

1.4 SUBMITTALS

A. Comply with Section 01330 (01 33 00) – Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit the following:
   1. Wiring Diagrams: Indicate wiring for each item of equipment and interconnections between items of equipment.
   2. Include manufacturer's names, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

D. Installation and Operation Manuals:
   1. Submit manufacturer's installation and operation manual, including operation instructions and component wiring diagrams.
   2. Provide detailed information required for Owner to properly operate equipment.

E. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: ISO 9001:2008 certified company.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials during handling and installation to prevent damage.

1.7 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Aiphone Corporation, 1700 130th Avenue NE, Bellevue, Washington 98005. Toll Free (800) 692-0200. Phone (425) 455-0510. Fax (425) 455-0071. Website www.aiphone.com. E- mail info@aiphone.com.

2.2 SECURITY AND COMMUNICATION SYSTEM

A. Integrated Security and Communication System: Aiphone "AX Series".
   1. Power Source:
      a. 24 V DC, 2 A.
      b. Two PS-2420UL (110 V AC) per video system. One PS-2420UL (110 V AC) per audio system.
   2. Door Station Calling:
      a. Tremolo call tone programmable from 10 to 600 seconds or infinite.
      b. LCD monitor remains on for duration of call-in and communication up to a maximum of 10 minutes.
   3. Master Station Calling: Select station to call, pre-tone sounds, then speak hands-free or push-to-talk.
   4. Communication:
      a. Auto: VOX.
      b. Manual: Press-to-talk, release-to-listen.
   5. Camera: CCD 250,000 pixels.
   6. Video Monitor:
      a. 3.5-inch direct view TFT color LCD.
      b. Scanning Lines: 525.
   7. Door Release: N/O or N/C, programmable per station.
   8. Door Release Contact: 24 V AC/DC, 0.5 A.
   9. Wiring: CAT-5e UTP-4 homerun from each station to CEU.
   10. Distance:
      a. Door Station to CEU: 980 feet maximum.
      b. Master Station to CEU: 980 feet maximum.
   11. CO Line Transfer Adaptor: Viking Electronics, Inc. "K-1900-5 Hot-Line Pulse Dialer".

B. Central Exchange Unit:

   1. Expanded Central Exchange Unit: Model AX-248C.
      a. Connect: Maximum of 8 master stations and 24 door stations.
      b. Current Consumption:
         1) Video: 1100 mA maximum.
         2) Audio: 1250 mA maximum.
      c. Video Output:
         1) NTSC standard 1 Vpp (0.7 to 1.4 Vpp).
         2) Two BNC.
      d. Video Output Trigger:
         1) Open collector output.
         2) 24 V DC, 30 mA.
         3) Two RJ-45.
      e. Master and door stations homerun to CEU for connection and programming.
      f. RJ-45 Input Jacks: Station connection, add-on CEU connection, and CO line output.

g. Quick Release: Dry contact terminals for door release functions and power supply connection.
h. RS-232 Connection:
   1) Input: Programming.
   2) Output: Event logging and CCTV/access control interface. Software as specified in Section 28500.
i. Composite video output (BNC).
j. Selective door release programmable to N/O or N/C.
k. CCTV and access integration.
l. Programmable by PC.
m. Rack mountable (2U).
n. Operating Temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).
o. Power switch.
p. Power/Communications Error Display LED:
   1) Off: Power off.
   2) Lit: Power on.
   3) Flashing: Error in device or wiring.
q. Ports:
   1) Door station ports.
   2) Master station ports.
   3) Add-on exchange unit ports.
   4) CO line port.
   5) Setting/log port.
   6) Video output ports.
   7) Video output trigger ports.
   8) Door release relay ports.
   9) Power supply ports.

C. Master Stations:

1. Master Stations: Audio/Color Video Model AX-8MV
   a. CAT-5e homerun wired to CEU.
   b. Buttons:
      1) 8 individual door station selector buttons with LED.
      2) 8 individual master station selector buttons with LED.
      3) Door release button with LED.
      4) Scan monitor button with LED.
      5) CO line transfer button with LED.
      6) Privacy button with LED.
      7) Oversized TALK button with LED to activate VOX or PTT style communication.
      8) ALL CALL button.
      9) OFF button.
   c. Occupied LED.
   d. Speaker.
   e. Microphone.
   f. Volume Controls:
      1) Receive Switch: Low, medium, high.
      2) Transmit Switch: Low, medium, high.
      3) Call tone.
   g. LCD brightness control.

h. Jacks:
   1) Headset receiver.
   2) Headset microphone.
i. Headset Volume Controls:
   1) Receiver.
   2) Microphone.
j. Directory Cards and Covers:
   1) Master station.
   2) Door station.
k. Reset switch.
l. RJ-45 jack for connection to CEU.
m. Connector for add-on selector on master station.
n. Door call-in indicator.
o. Hands-free or push-to-talk communication.
p. All Call to master stations.
q. Scan monitoring.
r. Selective door release.
s. Privacy and mute functions.
t. Wall or desk mount. Metal bracket included for wall mounting.
u. Multi-Pin Connector:
   1) Video output from master station.
   2) External signaling of call tones (through IER-2 or activation of TAR-3).
   3) Footswitch activation for TALK function.
v. Operating Temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).
w. Monitor: 3.5-inch color LCD, master station Model AX-8MV.
x. Outside Video Output: NTSC standard 1 Vpp (0.7 to 1.4 Vpp), master station Model AX-8MV.

D. Door Stations:
1. Audio Door Station: Model AX-DM.
   a. Cover: ABS Plastic.
   b. Mullion surface mount.
   c. Call button.
   d. Speaker.
   e. Microphone.
   f. Locator LED: Red.
   g. CAT-5e homerun wired to CEU.
   h. Weather resistant.
   i. Operating Temperature: 14 degrees F to 140 degrees F (minus 10 degrees C to 60 degrees C).
   j. Vandal resistant.
2. Fixed Color Video Door Station: Model AX-DVF.
   a. Faceplate: Stainless steel.
   b. Flush mount.
   c. Call Button: Metal.
   d. Camera.
   e. Camera Protection: Clear Lexan lens cover.
   f. RJ-45 jack.
   g. Speaker.

h. Microphone.
i. Directory card.
j. White Illumination LEDs: Automatically turn on in low-light conditions.
k. CAT-5e homerun wired to CEU.
l. Operating Temperature: 14 degrees F to 140 degrees F (minus 10 degrees C to 60 degrees C).
m. Vandal resistant.

3. Fixed Color Video Door Station: Model AX-DVF-P.
   a. Proximity Card Reader: Embedded "HID ProxPoint Plus".
   b. Faceplate: Stainless steel.
   c. Flush mount.
   d. Call Button: Metal.
   e. Camera.
   f. Camera Protection: Clear Lexan lens cover.
   g. RJ-45 jack.
   h. Speaker.
   i. Microphone.
   j. Directory card.
   k. White Illumination LEDs: Automatically turn on in low-light conditions.
   l. CAT-5e homerun wired to CEU.
   m. Operating Temperature: 14 degrees F to 140 degrees F (minus 10 degrees C to 60 degrees C).
   n. Vandal resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive integrated security and communication system.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install integrated security and communication system in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Mount equipment plumb, level, square, and secure.

C. CAT-5e Cables:
   1. Run cables from and homerun to one central location where CEU will be installed.
   2. Maximum Cable Runs: Keep each cable run to a maximum of 980 feet from communication device to CEU.
   3. Maintain twists of cable pairs to point of termination or no more than 0.5-inch untwisted.
   4. Do not remove more than 1 inch of jacket when terminating cables.
   5. Cable Bends:
      a. Make gradual bends of cable, where necessary.

b. Do not make bends of cable sharper than 1-inch radius.
c. Do not allow cable to be sharply bent or kinked at any time.

6. Cable Ties: Dress cables neatly with cable ties using low to moderate pressure.
7. Cross-connect cables, where necessary, using CAT-5e rated punch blocks and components.
8. Do not splice or bridge cables.
9. Cable Pulling:
   a. Pull cable with low to moderate force.
   b. Do not use oil or other lubricants not specifically designed for cable pulling.
10. Keep cables as far away from potential sources of EMI as possible.
11. Do not tie cables to electrical conduits or lay cables on electrical fixtures.
12. Cable Supports:
   a. Install proper cable supports a maximum of 5 feet apart.
   b. Do not support cables by ceiling tiles.
13. Label Cable Termination Points: Use unique number for each cable segment.
14. Testing Cables: Test installed cable segments with cable tester.
15. Jacks: Install jacks to prevent dust and other contaminants from settling on contacts.
16. Cable Slack:
   a. Leave extra slack on cables, neatly coiled-up in ceiling or nearest concealed place.
   b. Leave a minimum of 1 foot of cable slack at door station side and a minimum of 10 feet of cable slack at CEU side.
17. Do not install cables taught.
18. Grommets: Protect cables with grommets where passing through metal studs or other items that could damage cables.
19. Do not mix TIA/EIA 568A and 568B wiring on same installation. Use TIA/EIA 568B wiring throughout installation.
20. Staples:
   a. Do not use staples that crimp cables tightly.
   b. Do not use T-18 and T-25 cable staples.
21. Use firestop cables that penetrate firewalls.
22. Use plenum-rated cables where mandated.

3.3 ADJUSTING

A. Adjust integrated security and communication system for proper operation in accordance with manufacturer's instructions.

3.4 DEMONSTRATION AND TRAINING

A. Demonstration:
   1. Demonstrate that integrated security and communication system functions properly.
   2. Perform demonstration at final system inspection by qualified representative of manufacturer.

B. Instruction and Training:
   1. Provide instruction and training of Owner's personnel as required for operation of integrated security and communication system.
   2. Provide hands-on demonstration of operation of system components and complete system, including user-level program changes and functions.
   3. Provide instruction and training by qualified representative of manufacturer.

3.5 PROTECTION

A. Protect installed integrated security and communication system from damage during construction.

END OF SECTION

SECTION 282300 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Requirements of Drawings, General and Supplementary Conditions, Divisions 00 and 01 apply to this section.

1.2 SUMMARY

Contractor shall provide the CCTV equipment and meet the minimum specification noted in the basis of design. Contractor shall be responsible for connectivity from the camera to the fiber connection at each building interface. Fiber infrastructure from the building to building will be provided by owner. All connectors, cable and power required will be by the contractor. Cameras will be connected to existing Genetec CCTV platform located at the engineering building. Camera Licenses and storage will be provided under a separate contract.

All cameras will be IP based POE cameras, exterior cameras noted will require additional power in addition to POE. The following cameras are meant to establish a minimum specification and will be the contractors' responsibility to confirm that alternates meet specification and compatibility with Genetec recording platform.

A. Related Sections:
   1. Basic Material and Methods for Electronic Systems: Section 280500
   2. Security Management System: Section 285000

1.3 SUBMITTALS

A. Shop drawings:

   1. Submit for review by the Architect/Engineer, complete engineering data for each system for evaluation of the proposed system with respect to specification requirements. Submittals for each system shall consist of engineering data sheets, schedules, and manufacturer's descriptive catalog sheets for each system component and manufacturer prepared shop drawings to indicate conformance with the contract documents.
      a. Provide complete floor plans. Each plan shall show proposed device locations.
         1) Show actual device nomenclature as illustrated on riser and single line diagrams
         2) Show pullboxes, equipment enclosures and terminal cabinets.
         3) Show conduits and fill (optional if lateral conduits are shown with size and fill on the riser).
      b. Riser diagram:
         1) Illustrate conduit relationships between devices shown on the floor plans.
         2) (Lateral conduits are optional if shown on the plans).
         3) Show actual device nomenclature as illustrated on the plans and breaker number where the power will be sourced.
      c. Single-line diagrams:

1) Show signal relationships of devices within the system.
2) Show actual device nomenclature as illustrated on the riser and plans.
3) Show wire numbers.

d. Equipment enclosure wiring diagrams:
1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
2) Show the device nomenclatures exactly as shown on the single line diagrams.
3) Show the terminations including the wire numbers as shown on the single line diagrams.
4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.

e. Free standing device wiring diagrams:
1) For each free standing device, such as a computer, printer or the like, show the rear elevation of the device as a pictorial.
2) Show the termination connectors on the device.
3) Show the wire numbers attached to the connectors.
4) Schedule the wire colors connected to the pins on each device connector.

f. Custom assembly diagrams:
1) For each custom assembly such as a receptacle assembly, control panel or the like, provide an assembly drawing illustrating the appearance of the assembled device including dimensions, assembly components and functional attributes (momentary or alternate action switch, lens color, panel finish and the like).

g. Specification comparison:
1) Copy of specification annotated on line by line basis where proposed product or system differs from specified product or system. Any differences to be explained.

2. When application engineering and submittals have been prepared, a meeting shall be set up with the Architect/Engineer and Owner for preliminary shop drawing review. The project superintendent for the work of this division shall explain the entire system operation, equipment and other items as called for in the specification. Any drawings required shall be submitted one week in advance of proposed meeting date and preliminarily reviewed at this meeting. This meeting will be held in the Owner's jobsite office.
3. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item. Manufacturer description sheets shall have an arrow stamp pointing to each item on the sheet that is intended for review. Each operational feature of the systems included shall be addressed in narrative form and relate to specific system requirements described in the plans and specifications. All drawing submittals shall be submitted on same size sheets, identified by system, and sequentially numbered throughout the entire set.
4. Submittals shall be made for each of the systems being supplied for the project.
5. All shop drawings required shall be submitted at the same time in one packaged submittal.
6. Provide on drawings 30” x 42” size.

B. Product data:

1. Product list for Division 28 equipment.
2. As indicated in each Division 28 section and as indicated herein
3. Description of system operation indicating overall system operation and purpose and capabilities of each component within system.

4. Cross reference data sheets to components shown on system/riser diagrams.
5. Record drawings:
   a. Keep a complete set of all electronic systems drawings in job site office for showing actual installation of electronic systems and equipment. Drawings shall show location and routing of conduit and cable.
   b. Use this set of drawings for no other purpose.
   c. Where any material, equipment, or system components are installed differently from that shown, indicate differences clearly and neatly using ink or indelible pencil.
   d. At project completion, submit record set of drawings to Construction Manager for review and distribution to the

C. Shop drawing/Schedule, detailing system equipment such as, but not limited to, the following:

1. Main equipment racks and cabinets.
2. Master Intercom, Intercom Switches and Control Systems/Amplifiers.
3. Monitor panels.
4. Intercom master stations and intercom stations.
5. Corridor/Ceiling/Wall-mounted Speakers & Speaker-Microphones.
6. Exterior Speakers and associated mounting equipment.
7. Housing for Loudspeaker assemblies.

D. Provide three (3) operation and maintenance manuals upon completion of system installation. The manuals shall contain complete system block diagram, component data sheets, voltage charts, and schematic diagrams as well as complete operation instructions.

E. Product Certificates: Signed by manufacturers authorized distributor of proposed equipment certifying that products furnished comply with specified requirements.

F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by installer.

G. Maintenance Data: For equipment to include in maintenance manuals specified in Division 01. Include record of Owners equipment-programming option decisions.

1.4 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair and/or replace equipment that fails in materials or workmanship within specified warranty period.

B. Manufacturer Warranty: Provide 3 year warranty from date of substantial completion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

C. Underwriter's Laboratories under UL Standard 1459 shall list the communication system supplied. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

1.6 OWNER'S TRAINING

A. Train Owner's maintenance personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventing maintenance of the system. Provide a minimum of eight hours training.

B. Schedule training with Owner, with at least seven days advance notice.

C. Occupancy Adjustments: When requested by the Owner within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, adjusting controls and reprogramming to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

D. Acceptance: The Contractor shall provide the Owner with a written certification indicating the following:

1. The name of the factory trained person(s) that performed the testing.
2. A copy of that trained person's certification from the manufacturer.
3. A statement certifying that all systems were properly tested and are functioning as specified.
4. A statement certifying warranty requirements in accordance with specification requirements.

E. The Contractor shall submit the above documentation through the proper channels for acceptance.

F. The Owner and/or his representative shall conduct a detailed inspection/test of the system(s). In the event the system(s) does not function as specified, the Contractor, at no additional cost to the Owner, shall remove and system and furnish and install the specified system(s).

G. Only after the above has been executed, shall the system(s) be accepted. The system(s) warranty period shall begin on the same day acceptance is granted.

1.7 EXTRA MATERIALS

A. Provide the following spare parts.

1. Camera: One complete assembly (Housing, Camera, Lens and Mount) of each type installed.
2. Connectors: Five of each type installed.

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:

1. Video surveillance equipment:
   a. Base: AXIS
   b. Optional: Panasonic, Vicon and Bosch
2. Lens:
   a. Base: AXIS
   b. Optional: Panasonic, Vicon and Bosch
3. Housings:
   a. Base: AXIS
   b. Optional: Panasonic, Vicon and Bosch
4. Mounts:
   a. Base: AXIS
   b. Optional: Panasonic, Vicon, and Bosch
5. Video switcher/control system:
   a. Base: Milestone
   b. Optional: Axis, Panasonic, Vicon, and Bosch
6. Wire and cable:
   a. Base: Belden
   b. Optional: West Penn
7. Other manufacturers desiring approval comply with Division 01 sections.
8. Or approved equal.

B. System operation:

1. Provide complete system for viewing of remote scene including control of equipment accessories.
2. Provide automatic call-up of scene to selected monitors on operation of intercom icon associated with camera viewing intercom scene. At movement doors with cameras on both sides of door, the camera on each side of door shall be called up to associated monitors adjacent to touchscreen.
3. Provide control interface with PLC system.

2.2 CAMERAS AND ACCESSORIES

A. Camera type: Interior or exterior fixed high resolution color IP camera mounted in dome housing.

Basis of Design – AXIS P3245-VE or approved equal – Provide all accessories necessary for a complete installation including but not limited to mounting brackets, drop ceiling kits, etc...

1. CMOS image sensor: 1/2.8”
2. Resolution: 1920x1080
3. UL listed, CSA certified.
4. WDR.
5. Vari-focal lens: 3.4-8.9 mm.
6. Auto iris.
7. Remote Focus/Zoom
8. Operating temperature range -40 deg C to 50 deg C.
9. ONVIF certified.
10. IP Based POE – Power of Ethernet.

11. Vandal Resistant.

B. Camera type: Elevator corner mount fixed high resolution color IP camera.

Basis of Design – AXIS P9106-V or approved equal – Provide all accessories necessary for a complete installation including but not limited to mounting brackets, drop ceiling kits, etc...

1. CMOS image sensor: 1/3".
2. Resolution: 2016x1512, 1920x1080
3. UL listed, CSA certified.
4. WDR.
5. Vari-focal lens: 3.4-8.9 mm.
6. Auto iris.
7. Remote Focus/Zoom
8. Operating temperature range -15 deg C to 50 deg C.
9. ONVIF certified.
10. IP Based POE – Power of Ethernet.
11. Vandal Resistant.

C. Camera type: Exterior fixed multi-imager 180 degree IP camera.

Basis of Design – AXIS Q3708-PVE or approved equal – Provide all accessories necessary for a complete installation including but not limited to mounting brackets, back box kits, etc...

1. CMOS image sensor: 3 x 1/1.8"
2. Resolution: 3x 2560x1440
3. UL listed, CSA certified.
4. WDR.
5. Vari-focal lens: 3.4-8.9 mm.
6. Auto iris.
7. Remote Focus/Zoom
8. Operating temperature range -40 deg C to 55 deg C.
9. ONVIF certified.
10. IP Based POE – Power of Ethernet.
11. Vandal Resistant.

2.3 MOUNTS

A. Provide mounts and hardware as required for installation of cameras and enclosures as indicated on drawings and installation details.

B. Provide wall/corner adapters for installation as indicated on drawings and installation details.

C. C. Provide mounting hardware for comer/wall type mounts for exterior building installations as indicated on drawings and details.

2.4 VIDEO WIRING SYSTEMS

A. Video signal cable: Category 6

1. Temperature range: -30 to +75 degC.
2. AWG: 20 GA solid copper
3. Nominal impedance: 75 ohms.
4. Nominal capacitance: 17.3 picofarads per FT.
5. Dielectric strength: 5000V RMS, 60Hz.
6. Nominal attenuation: 2.7 dB/100 FT at 200 MHz.
7. Shield: Bare and copper braid, 95 percent coverage.
8. Belden 1426A

B. Power via POE for distribution to cameras:

C. PoE over Coax for elevator cameras.
1. Basis of Design: Axis T8640

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all equipment in accordance with manufacturer's recommendations.

B. Install all wiring in metallic conduit in exposed locations, minimum size 3/4 IN, dedicated for intercom and paging speaker wiring only. Wiring shall be installed without splices.

C. Install all wiring along J-Hooks above accessible security ceilings – plenum rated cable dedicated for intercom and paging speaker wiring only. Wiring shall be installed without splices.

D. Make all connections to video equipment with approved connectors for cable used.

3.2 WIRING

A. Coordinate with division 26contractor for 120 volt power requirements for all equipment and accessories. Connect systems head-end equipment to UPS system.

3.3 TESTING

A. Test all system components and connections using methods as recommended by the equipment manufacturer.

END OF SECTION 282300

SECTION 283111 ADDRESSABLE FIRE ALARM SYSTEM – NON VOICE

PART 1 - GENERAL

1.01 Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the schematic design drawings and related construction documents including General and Supplementary Conditions and Division 01 General Requirements, shall be included in and made part of this Section.

1.02 DESCRIPTION OF WORK

A. This section of the specifications includes the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

1. The system shall be a new addressable fire detection and non-voice signaling system in accordance with the schematic design drawings. It shall utilize control panels with digital communications to provide optimal fault-tolerance and support future modification and expansion with a minimum of future wiring and hardware additions, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.

    a. This fire alarm design is for monitoring of the enclosed parking basement dry sprinkler system and providing elevator life safety interface. Alarm notification and appliances have been located only on the level protected by fire sprinklers, per minimum state code requirements. A single smoke detector shall be installed above the fire alarm control panel and manual pull located next to the panel.
    b. The system provided shall have the capacity and expansion capability to support future tenant improvement fitouts, in compliance with relevant codes and modify the fire alarm based on the improved layout and specific occupancy type prior to any fitout construction.

2. The system shall include all necessary hardware, software and peripheral devices to perform the following functions, but not limited to:

    a. Fire and smoke detection
    b. Manual alarm activation
    c. Occupant audible, visual and auxiliary notification
    d. Life safety functions to include:

        1) Elevator Service

    e. Report system events to the Listed Supervising Station via the approved means.
    f. System programming and re-programming of all changes as necessary to accommodate the phased construction, alteration and demolition activities.

3. The system shall be installed per the Engineer of Record's schematic design drawings, project specifications and installed in full compliance with National, State and local Codes. These published editions of following reference standards shall be used in system design, installation, operation and maintenance unless the applicable legally referenced standard provides more stringent requirements:

    a. New Jersey Uniform Construction Code - International Building Code 2018 Edition
    b. New Jersey Electrical Code – National Electric Code 2018 edition.
    c. Underwriters Laboratories (UL) Listings.
    d. City of Elizabeth Fire Department Regulations
    e. Americans with Disabilities Act (ADA), the Architectural Barriers Act (ABA), and Accessibility Regulations of the local jurisdiction.
    f. Applicable FM Global (Factory Mutual) Property Loss Data sheets.

4. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the schematic design drawings, whether or not specifically itemized herein. All devices installed outdoors or within areas exposed to unconditioned spaces or wet locations shall be listed for "outdoor use". Electrical raceway, fittings and enclosures shall be NEMA Type 4.

5. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over 20 years.

6. Provide the services of qualified system designers to generate shop drawings, and field technicians to provide installation oversight during construction and system startup. Technicians shall inspect, program, test and make any necessary adjustments to the completed system, to ensure compliance with the manufacturer's recommended practices and the approved shop drawings.

7. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.

8. In the interest of job coordination and responsibilities the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests. All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified.

9. The manufacturers listed within this specification have been preselected for use on this project. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications. No submittal will be accepted from a manufacturer other than those specified. All system components shall be the products of one manufacturer, except where otherwise dictated or permitted. In such instances, equipment by multiple manufacturers must be recognized compatible by both manufacturers. Approved Manufacturer Suppliers:

    a. Siemens Building Technology – Factory Office
    b. Simplex JCI – Factory Office
    c. UTC/Edwards System Technology (EST) – Strategic Partner
    d. Or approved equal.

10. Strict conformance to this specification is required to ensure that the installed and programmed system will function as design, and will accommodate the future

requirements and operations of the building owner. All specified operational features must be met without exception.

1.03 DEFINITIONS AND ACRONYMS

A. AHJ: Authority Having Jurisdiction, the individual or agency that has legal responsibility for reviewing the design for conformance with local codes and regulations.

B. ASME: American Society of Mechanical Engineers.

C. EoR: The Engineer of Record responsible for the Schematic Design drawings and project specifications

D. ERRCS: Emergency Responder Radio Communications System also known as a Public Safety or First Responder DAS (Distributed Antenna System).

E. FACP: Fire alarm control panel.

F. FM: FM Global (Factory Mutual).

G. Furnish: To supply the stated equipment or materials.

H. Install: To set in position and connect or adjust for use.

I. LED: Light-emitting diode.

J. NAC Booster: Notification Appliance Circuit audio and/or visual auxiliary power supply controlled and supervised by the FACP

K. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

L. NICET: National Institute for Certification in Engineering Technologies.

M. Schematic design drawings: drawings which establish the objectives and design criteria of the system along with locations of fire alarm equipment, a system concept riser diagram, identification of interface(s) required with fire safety functions, and identification of all initiating device and notification appliance locations.

N. Provide: To furnish and install the stated equipment or materials.

O. UL: Underwriters Laboratories.

1.04 PERFORMANCE-BASED DESIGN REQUIREMENTS

A. Fire alarm technicians must be able to perform comprehensive tests on the system with minimum disruption to occupants. Fire alarm system control must originate from the control panel and/or programmable field devices. Individual bypass switches located at the main control panel must provide system wide bypass for each type of output to accommodate testing with minimal disruption.

B. Field located transponders, NAC power booster panels, and terminal cabinets as required to support the project, if locations not specifically provided on the design drawings. Good access must be provided for testing and maintenance requirements.

C. NFPA 72 10.4.4 require smoke detection coverage above critical fire alarm components. The quantity of required NAC booster panels vary between manufactures and their installation location(s) are determined by the Installation Contractor. If area smoke detection is not provided in the vendor-selected NAC booster panel location, then a dedicated smoke detector shall be provided above the panel. These locations shall be shown on the installation shop drawings and approved by the EoR and AHJ prior to installation.

D. SLC Circuit Design: Ground Fault Detection

1. For addressable loops, ground fault detection shall be employed which can detect a ground fault on both the positive and negative side of each circuit. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. Ground faults shall not interfere with normal operation, such as alarm, or other trouble conditions.
2. In compliance with NFPA 72, section 23.6.1, provide fault isolation for every 50 devices on any SLC, limited to a maximum area of a floor or fire/smoke barrier compartment boundaries. Provide separate ground gault detection for each floor/ level.
3. A single fault on a pathway connected to the addressable devices shall not cause the loss of the devices in more than one zone or area. If a floor of the building is subdivided into multiple zones by fire or smoke barriers and the fire plan for the protected premises allows relocation of occupants from the zone of origin to another zone on the same floor, each zone on the floor shall be considered a separate zone.
4. Dedicated isolator modules or ground fault detection integrated into an addressable device may be used to ensure
5. Acceptable wiring designs

    a. Install SLC loops with no more than 50 addressable devices circuit, homeran back to the panel. Each SLC must be internally isolated from shorts.
    b. Provide field circuit isolation with loop isolator devices installed as the first device and keeping the isolated legs of the circuit to fewer than 50 devices.

E. Initiating Device Installation

1. Coordinate smoke detector locations with ceiling diffusers; none maybe closer than 3 feet.
2. For ceiling tile applications, center detectors in the tile, inline with other ceiling fixtures.

1.05 SEQUENCE OF OPERATIONS

A. Alarm Sequence of Operation:

1. Activation of a manual fire alarm box, automatic detector, or fire suppression system shall causes system to enter “alarm” mode including the following operations:

    a. Provide local English language annunciation of device location, address and condition, and audible and visual alarm signal at control panel and remote annunciators.
    b. Provide manual "acknowledge" function at control panel to silence audible alarm signal, visual signal remains displayed until initiating alarm is cleared.

c. Transmit “alarm” signal to off-premises equipment, i.e., to the Project Representative’s selected vendor. Provide necessary connections to digital alarm communicator transmitter.
d. Activate fire alarm notification appliances.
e. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

B. Supervisory Sequence of Operation:

1. Activation of gas detection, fire sprinkler tamper, pressure switch, duct mounted smoke detector or residential smoke detector with local audible base causes system to enter "supervisory" mode including the following operations:

a. Provide local English language annunciation of device location, address and condition, and audible and visual supervisory signal at control panel and remote annunciators.
b. Provide manual "acknowledge" function at control panel and remote annunciators to silence audible supervisory signal, visual signal remains displayed until initiating supervisory is cleared. If AHJ approved, a supervisory condition may be programmed as self-restoring.
c. Transmit "supervisory" signal to off-premises equipment.
d. For HVAC applications: transmit signal to shut down air associated air handling unit and close associated fire/smoke dampers.

C. Trouble Sequence of Operation:

1. System trouble, including single ground or open of supervised circuit, or power or system failure, causes system to enter "trouble" mode including the following operations:

a. Provide local English language annunciation of device location, address and condition, and audible and visual trouble signal at control panel and remote annunciators.
b. Provide manual "acknowledge" function at control panel and remote annunciators to silence audible trouble signal, visual signal remains displayed until initiating trouble is cleared.
c. Transmit "trouble" signal to off-premises equipment.

1.06 SEQUENCE OF INSTALLATION

A. This new system is being installed as part of a complete building construction project and shall be coordinated with the other trades and any construction phasing schedules. No existing fire alarm components shall be reused.

1.07 FIRE CONTROL PANEL – The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor based operating system having the following capabilities, features, and capacities:

A. Minimum 252 point addressable capacity with the ability to provide networking over dedicated copper or fiber for future connection to other county buildings.

   a. The system shall support up to 252 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
   b. The system shall support two loops of 252 addressable devices, each of which may be divided in any ratio on one, or two, isolated Class A circuits.
   c. The system shall be expandable and capable of providing a peer-to-peer network. Each panel shall have the ability to display either local panel activity or global network activity.

B. All control equipment shall be listed to the latest edition of UL Standard 864 (9^{th} Edition}

C. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.

D. Audibles and visual notification signals shall be synchronized throughout the entire building.

E. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

F. The system shall be capable of remote monitoring via Windows Explorer, which provides a graphical representation of the fire alarm control panel at a remote PC when connected via Ethernet to the system. The display will show the exact state of the panel, including blinking LEDs, and with menu buttons for control.

G. Support of single-person test system and capable of providing point test reports in NFPA standard format without manual report entries.

   1. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals, trouble signals shall be logged in system history during the walk-test.
   2. The control panel shall allow control and monitoring from a wireless handheld display device during maintenance, inspection and troubleshooting tasks
   3. The control panel shall allow complete control and monitoring from a wireless handheld display device during one-man testing of the system
   4. Testing supported should be real smoke testing of devices, automatically logged and made available in NFPA format reports. Manual test entries will not be accepted.

H. System shall provide an output port for monitoring purposes by external systems. Communications to an external system shall be RS-232 or RS-485 communications.

I. The local system shall provide status indicators and control switches for all of the following functions:

   1. Remote Alarm Transmission By-pass Switch: Shall prevent transmission of all signals to the main fire alarm control unit when in the "off" position. A system trouble signal shall be energized when switch is in the off position.

2. Drill Switch: Shall activate all notification devices without tripping the remote alarm transmitter. This switch is required only for general evacuation systems specified herein.
3. Door Holder By-Pass Switch: Shall prevent doors from releasing during fire alarm tests. A system trouble alarm shall be energized when switch is in the abnormal position.
4. Elevator recall By-Pass Switch: Shall prevent the elevators from recalling upon operation of any of the devices installed to perform that function. A system trouble alarm shall be energized when the switch is in the abnormal position.
5. HVAC/Smoke Damper By-Pass: Provide a means to disable HVAC fans from shutting down and/or smoke dampers from closing upon operation of an initiating device designed to interconnect with these devices.
6. Any additional status or control functions as indicated on the schematic design drawings, including but not limited to: emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

J. The system shall be UL 1076 listed for monitoring and reporting security System Zoning.

K. The system shall be compliant with the requirements of NFPA 720 as a Carbon Monoxide Detection Control Unit and shall meet the UL 2075 listing requirements. All inputs from CO sensors shall be indicated visually and audibly at the control panel. CO sensor inputs shall be distinct and descriptively annunciated from other signals.

L. Each intelligent addressable device or conventional zone on the system shall be displayed at the main fire alarm panel and each local fire alarm remote annunciator by a unique alphanumeric label identifying its location.

1.08 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72 installation methods, all contract documents and specification requirements.

1. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.
2. Strobes shall be synchronized throughout the entire building.
3. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
4. Incorporate firefighter emergency communication systems, as specified.

B. Circuits and Pathways

1. Network Communications and vertical trunk wiring: all data wiring and audio risers shall be Class A, circuits as defined in NFPA 72, utilizing physically separated outgoing and return loops and Level 2 survivability (minimum).
2. Addressable Signaling Line Circuit (SLC) wiring shall be configured as Class B circuits, with a minimum Level 1.

    a. SLC wiring shall utilize fault isolation modules so that a single wiring fault on the conductors serving one floor or evacuation signaling zone will not affect the operation of devices serving any other zone.
    b. SLCs shall not exceed 75% of the number of each type of device the circuit is capable of supporting.

3. Notification Appliance Circuit (NAC) wiring shall be configured as Class B circuits.

a. The system shall be provided with a minimum of two (2) NACs for each floor, evacuation zone or smoke compartment; whichever is greater. Arrange circuits to allow individual, selective, and visual notification by zone. The actual number of circuits to be installed shall be coordinated with the supplier's shop drawings. Appliance circuits shall be zoned to correspond with the building fire barriers and other building features.

C. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

D. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals and trouble signals shall be logged on the system printer and in system history during the walktest.

E. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

F. An Emergency Responder Radio Communications System (ERRCS), also known as a Public Safety or First Responder DAS (Distributed Antenna System), has become a mandated in-building requirement for many municipalities around the country and may be required per site conditions to boost weak emergency responder radio signal strength signals, as specified in Section 275319. It shall be a separate communication system from the FACP, but shall provide the ability to add the required monitoring points for general status conditions per NFPA 72 requirements.

1.09 SUBMITTALS

A. The equipment supplier responsibilities will include the selection of equipment, devices and materials based on the schematic design drawings and project requirements, and their proper application based on the manufacturer’s limitations, operating characteristics and recommended practices.

1. Equipment quantities and locations shown on the schematic design drawing floorplans shall not be altered or modified without written approval of the Engineer of Record. Any deviation from the Engineer’s coordinated layout or design intent will constitute the submission as incomplete and shop drawings will not be approved.
2. Minor deviations, variations, changes, and corrections from layouts shown on the drawings (based on coordination, conditions, manufacturer's instructions, codes and standards, shop drawings, and verification of measurements and conditions) are permitted to facilitate construction provided the changes do not represent potential changes in scope of work and provided the changes are acceptable to the owner, architect, and engineer.
3. The equipment supplier shall coordinate the installation and system operation with the work of related trades.

B. Catalog manufacturer’s product data sheets for all equipment, accessories and wiring with all applicable components being submitted for this project clearly noted. All equipment shall be subject to approval and no equipment shall be ordered without prior approval.

1. Data Sheets with multiple product shall highlight or identify the specific products utilized for this project.

C. System Calculations - Circuit calculations shall use the end-loading or point-to-point method described in NFPA recommended practices including both standby and active conditions.

Complete calculations shall be provided which show the electrical load for all equipment and field circuits. (identify all mathematical formulas, variables, and constants used in all calculations) on the following system components:

1. Horn/ strobe 24VDC loads and spare capacity.
    a. NAC circuit (audible and visual) design shall incorporate a 20% spare capacity for future expansion.
2. Show wire size, estimated circuit length, and maximum allowable wiring distance as designed. Voltage drop calculations for wiring runs demonstrating worst-case condition.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.

D. The shop drawing submittal shall clearly indicate all proposed equipment and devices (type and quantity), with wiring diagrams, detailed operational sequences, and interfaces to related systems. They shall be prepared in accordance with NFPA 72 recommended practices and include the following:

1. Floor plans showing all devices and equipment to be installed with corresponding field settings, circuit, and device designations noted. Settings shall include the device address and candela rating as applicable. Circuit identifiers, device numbers and symbols used shall be clearly defined and consistent between all related documents.
    a. Floor plans at a scale of 1/8”=1’-0”
    b. When candela ratings are not shown on the schematic design drawings, utilize NFPA 72 visual coverage area tables to select coverage.
2. Complete point-to-point riser diagrams showing all equipment including size, type, number and reference designations for all circuits and devices. Each device shall be shown with address numbers or any other required field device settings including candela rating of notification appliances.
    a. For multiple panel configurations, proved a separate block diagram to show the overall network system architecture with interconnection network circuits.
3. System panel drawings showing cabinet dimensions, internal module placement, field wiring terminations with spare capacity allowances, and any applicable operator's display and panel switch label assignments. Where multiple equipment cabinets are used in a single location these shall be shown together in elevation for coordination of equipment installation and wireways, and to ensure proper space allocation.
4. Provide a complete sequence of operation in the form of an NFPA lnput/Output programming matrix for the entire system as shown in NFPA 72. The matrix shall reflect each unique programmed sequence, whether the sequence is initiated by an individual or common group of similar devices. Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions.
5. Installation drawings shop drawings, and as-built drawings shall be prepared by a NICET II or higher individual experienced with the work specified herein.
6. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

a. Disposition of shop drawings shall not relieve the Contractor from responsibility for deviations from drawings and specifications, unless the deviations are specifically noted in writing at the time of submission, and written acknowledgement has been received from the Engineer or Record. The disposition of shop drawings shall not relieve the Contractor from responsibility for errors in shop drawings or schedules.
b. Copies of the approved shop drawings shall be maintained on-site to serve as working documents during installation for preparing as-builts.

E. Delegated Design Review of Shop Drawings: As required per the AHJ, in addition to items listed above, provide a compliance and code review by an individual with the required credentials and submit documentation, including any evaluation analysis of the shop drawing submittal. Provide the required review's credentials and seal/ signature by the qualified professional engineer responsible for the preparation, as required. The equipment supplier's shop drawings shall not be stamped or sealed by an Engineer unless the work is performed under their direct supervision and control.

1.10 QUALITY ASSURANCE

A. The following shall be adhered:

1. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.

2. Owner's best practices for fire alarm installations/ operations including compliance with site standard operating procedures (SOP's).

B. Equipment Supplier Qualifications

1. The supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The distribution shall be from factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning. Single source system suppliers are not acceptable. The initial installation and commissioning shall be provided by a factory direct branch to ensure a high level of quality for the customer.

2. A service office must be within 50 miles of the project site.

3. The manufacturer shall provide evidence of successfully installed similar fire detection and notification systems on comparable size and scope. The owner reserves the right to reject any installer's bid for which evidence of a successful prior installation by the contractor cannot be provided.

a. The equipment and service provider shall have a minimum of 10 years experience in the fire protective signaling systems industry.

4. Shall be licensed in the jurisdiction, if required.

5. The equipment supplier shall have a licensed fire protection engineer on staff to assist with all aspects of the installation including interfacing with the local AHJ and code consulting.

6. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall

provide the required instruction to the owner's personnel in the system operation and maintenance.

7. The Equipment Supplier shall have in-house engineering and project management capability consistent with the requirements of this project. Factory trained representatives of the system manufacturer shall perform the detailed engineering of the system.

C. Installer Qualifications:

1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.

2. The contractor shall submit copies of all required licenses and bonds as required in the State having jurisdiction.

3. The system installer shall work with the system supplier/designers to ensure all equipment is installed as shown in the Shop Drawings and manufacturer's requirements, and programmed to comply with the project requirements.

4. The installing contractor is responsible for coordination with related trades, and complete (1st party) testing of the system as installed, to include verification that the system performs as intended, and all devices and fault conditions are properly supervised and reported as specified herein.

D. Testing Agency Qualifications: Qualified for testing indicated.

E. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.12 PROJECT CONDITIONS

A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.13 WARRANTY

A. The equipment and wiring shall be warranted to be free from electrical, mechanical and performance defects, within the specified warranty period. Equipment and components that fail in materials or workmanship must be repaired or replaced. It shall include all labor/travel time, parts and programming. The warranty also provides for the adjustment of smoke detector sensitivities due to unwarranted or nuisance detector activations.

1. Warranty Period: One year.

2. Warranty Initiation: Commencing with start-up and owners beneficial use of any portion of the system.
3. The warranty does not cover cases involving component failure due to abuse, misuse, and/or "Acts of God" including but not limited to lightning strikes, flooding, power surges, and fire.
4. This warranty is void if the product is altered, repaired, or serviced by anyone other than original equipment installer.
5. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.

B. All labor for administering and servicing the warranty, including actual replacement of parts, will be the responsibility of the Installer for the warranty period.

C. This Warranty does not apply to the replacement of consumable parts such as internal standby batteries. These components are designed to diminish over time unless failure has occurred due to a defect in materials, equipment malfunction, or expose to ambient conditions beyond their UL listing. As with all batteries, the maximum capacity and performance of the battery will decrease with time and use; this is not a defect. The expected lifespan of a fire alarm battery under normal conditions is 3 years. Only defective batteries and batteries that leak are covered by this warranty.

D. The Owner reserves the right to make changes to the fire alarm system during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any such changes made by Owner, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the fire alarm system.

1.14 SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for 1 year.

B. Upgrade Service: Update software, firmware, to latest version at project completion. Install and program software upgrades that become available within one year from date of substantial completion. Upgrading software, firmware shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.15 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. The following spare devices shall be supplied (minimum of one each) consistent with the project:

1. Two (2) percent smoke detectors device(s).
2. Two (2) percent heat detectors device(s).
3. Two (2) percent pull stations device(s).
4. Two (2) percent standard notification appliance(s) (speaker, strobe & combination).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The equipment and service described in this specification are those supplied and supported by Siemens Industry and represent the base bid for the equipment.

1. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.

B. Must have multi-channel distribution for both products and equipment service. The owner shall have the ability change service provider or sales outlets. Proprietary manufactures such as single-channel suppliers are not acceptable.

1. The initial installation shall be completed by a factory direct office.

2.02 CONTROL PANEL

A. The fire alarm control panel shall be microprocessor-based using multiple microprocessors throughout the system, providing rapid processing of smoke detector and other initiation device information to control system output functions. The System Periphery board shall be capable of a minimum of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits. Any trouble on one circuit shall not affect the other circuit. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following; Power, Gnd. Fault, Alarm, Trouble.

B. There shall be a watchdog circuit, which shall verify the system processors and the software program. Problems with either the processors or the system program the panel shall activate a trouble signal and reset the panel.

C. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage short term or long term to the control panel. After initial testing replace the test panel and proceed with complete testing.

1. The signal line circuits (SLC) shall be polarity insensitive for all addressable devices. This permits the fire detection devices to operate even when detector and module wiring polarity are inverted on the wrong screw terminals.

D. The primary control panel interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Fire control panels, when configured as a global PMI. The standard operator interface can acknowledge, silence, and reset panels via Global PMI.

E. System response time from alarm to output shall be an average of three (3) seconds.

F. To expedite system troubleshooting, the system cards shall have ground fault detection and diagnostic LEDs by card.

G. All system cards and modules shall have Flash memory for downloading the latest module firmware.

H. Passwords:

1. Maintenance/Control Password - There shall be a 5 character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions.

I. Networking – Command and Control:

1. A bidirectional data communications network transmitting multiplexed input and output signals, which shall be electronically supervised, shall connect all control panel nodes on a dedicated fire alarm network. The communication network shall consist of a communication circuits transmitting all system operations in a digitally encoded format.

2. Digital two-way communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either hard-wired copper or fiber optics technologies or combinations of both as required for the control panels to communicate.

3. The system shall be designed such that in the event of a network communications failure, any remaining interconnected panels will operate as a sub-network and any isolated panels will operate in standalone mode. Upon communications failure, a trouble condition will be reported across the network and the disconnected panel shall continue to function in standalone mode.

4. Capability shall exist within the system to extend the network at any node. The system shall support a maximum of two network extension circuits in series on any system branch, extending the inherent distance limitations for network communications.

5. Communication protocol shall be of the CSMA/CD (carrier sense, multiple access, collision detect) type, eliminating delays incorporated into other protocols. Communication techniques using token passing and requiring sensing of delays and re-generation of the token to re-establish network communications in the event of a fault shall not be acceptable.

6. Network Fiber Modules

    a. Capability to support multimode and single mode networks with the ability to switch between fiber types and copper networks between panel nodes.
    b. The network fiber interface modules shall be used to transmit RS-485 communications between the fire alarm control panels. Each module shall have power, transmit and receive status LEDs. The module can act as a repeater or end-point unit, in a daisy chain or star configuration. It shall be possible to connect the fiber interface modules directly to a fire alarm workstation without the need for additional interface devices or control equipment.

        1) The connection between the D2300CPS multimode fiber interface modules shall use 2 high quality duplex 50/125 or 62.5/125 fiber optic cables and ST style fiber connectors. Each segment of the fiber network can be up to 1.9 miles. The fiber module shall have a minimum operating power output budget of -13dB for 62.5/125 cable and -9 dB for 50/125 cable.
        2) The connection between the D2325CPS single mode fiber interface modules shall use 2 high quality duplex 9/125 fiber optic cables and ST style fiber connectors. Each segment of the fiber network can be up to 20 miles. The fiber module shall have a minimum operating power output budget of -16dB for 9/125 cable.

J. Networking – Monitoring:

1. TCP/ IP based, network communication for one-way supervision of fire alarm status data.

a. Ability to remotely monitor the fire alarm network activity from a single console or mobile device.
b. Ability to support multiple network topologies (ring, star, bus and bridged rings) for enhanced design and installation flexibility.

K. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.

L. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from spot detectors, VESDA detectors, monitor modules or manual station inputs). AND, OR, NOT, Any N, D Latch, RS Latch, Time Base Control, Start Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 2500 logic functions.

M. History: The system shall store 5000 events in history while in straight mode and 4500 in circular mode. In straight mode, trouble warnings will occur at 4000 and 4500 events. In circular mode, the control panels shall maintain a 2000 event Alarm History buffer, which consists of the 2000 most recent alarm events from the 4500 event history file.

2.03 PRIMARY POWER SUPPLY

A. The control panels, NAC power booster panels, system workstation, and any other fire alarm equipment shall receive their primary power from a dedicated 120VAC disconnect circuit.

1. The circuit must be properly sized and protected in accordance with NEC requirements.
2. This requirement does not limit that one dedicated branch circuit to serving only one power supply within a system. The dedicated branch circuit could supply several fire alarm power supplies within a control unit or within multiple interconnected control units that serve the signaling system.

a. The dedicated circuit can be supplied from any properly installed electrical panel board or sub-panel.
b. Minimum capacity of 6-amp that provides 24VDC power for system operation.
c. Ability to expand the power supply without adding additional cabinets.

3. The circuit disconnecting means shall be labeled ‘FIRE ALARM’ and any other local identification requirements. Its location must be listed at the point of connection to the fire alarm control equipment. Provide a dedicated breaker lock unless the breaker is located in locked panel board or if it is in a locked electrical room.

4. Transfer from AC to battery power shall be instantaneous when AC voltage drops less than 90% or brown out conditions it is not sufficient for normal operation.

B. Loss of primary AC power shall sound a trouble signal at the FACP. The FACP shall indicate when the system is operating on an alternate power supply.

2.04 SECONDARY POWER SUPPLY

A. When the primary AC power is lost, the system shall automatically switch to the secondary power supply.

B. The control panels, transponders, and NAC power booster panels shall receive their secondary power from batteries.

1. Battery shall be of the sealed lead-acid, maintenance free type, 24-volt nominal, suitable for life safety application.
2. Provide sufficient capacity to operate the complete alarm system in quiescent standby load (system operating in a non alarm condition) for a period of 24 hours and shall have sufficient capacity to operate all alarm notification appliances and all other connected loads for a period of 5 minutes.
3. The battery charger shall be able to charge the system batteries up to 100 AH batteries. Battery charging shall be microprocessor controlled and programmed to select battery sizes.
4. Transfer from AC to battery power shall be instantaneous when AC voltage drops to a point where it is not sufficient for normal operation.
5. Batteries shall be secured in seismic areas 2B, 3, or 4 as defined by the Building Code.

2.05 SYSTEM ENCLOSURE

A. The control unit shall be housed in a cabinet suitable for both recessed and surface mounting. Cabinet and front shall be corrosion protected, given a rust resistant prime coat, and manufacturer's standard finish. The outer doors shall be capable of being a left hand open or a right hand open. The inner door shall have a left hand opening. System enclosure doors shall provide where required ventilation for the modules or cards in the enclosure.

B. Enclosure needed to hold all the cards and modules as specified with at least 25% spare capacity for extra cards.

C. Provide system enclosure for all amplifiers. Where required by the manufacturer, provide means for venting heat from the enclosure either by having enclosure sides and top vented or the doors vented.

2.06 DOCUMENT STORAGE BOX

1. With every new system, a documentation cabinet shall be installed at the system control unit or at another approved location at the protected premises. Where the documentation cabinet is not in the same location as the system control unit, its location shall be identified at the system control unit. It shall meet NFPA 72’s record maintenance requirements and the following criteria:

a. Enclosure to accommodate standard 8-1/2-by-11 inch and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information.
b. Provide two key ring holders with location to mount standard business cards for key contact personnel.
c. Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
d. Color: Red powder-coat epoxy finish.
e. Labeling: Permanently screened with 1 inch high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
f. Security: Locked with 3/4 inch barrel lock. Provide solid 12 inch stainless steel piano hinge.

2.07 SYSTEM PRINTERS

A. A system printer is not required.

2.08 INITIATING DEVICES

A. General

1. The initiating device shall provide an alarm indication within less than four (4) seconds.
2. All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.
3. Operating Voltage: 24 VDC, nominal.

B. Multi-criteria Smoke Detectors – Addressable

1. The multi-criteria fire detectors shall be an intelligent digital photoelectric detector with a programmable heat detector. Detectors shall be listed for use as open area protective coverage, in-duct installation and sampling assembly installation and shall be insensitive to air velocity changes. The detectors' communications shall allow the detectors to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of 19 environmental fire profiles unique to the devices installed location.
   a. UL Listed as "direct in-duct" mounting.
2. The detector shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detector must provide different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
3. Smoke detectors shall be analog sensors that utilize photoelectric-type sensing principles mounted within a smoke chamber to detect particles of combustion.
4. The control panel shall continually analyze the analog signal from each sensor to determine calibration, sensitivity and environmental changes that may affect sensor operation. The analog values from each device shall be displayed (in terms of percent of obscuration) at the control panel upon command.
5. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm. Each detector shall include an LED that will flash periodically to indicate an active polling cycle. When the sensor reaches a predetermine alarm threshold (2% obscuration unless otherwise directed), the detector shall latch in LED shall flash continuously until reset at the control panel.
   a. The system shall have the ability to disable the detector's LED.
6. The detectors shall be UL listed for operation in a 95% relative humidity (RH) environment.
7. The detector shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes, and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.
8. The detectors shall support the use of a relay, or LED remote indicator without requiring an additional software address.
9. The intelligent smoke detector shall be capable of providing three distinct outputs from the control panel. The outputs shall be from an input of smoke obscuration, a thermal condition or a combination of obscuration and thermal conditions. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.

10. Where indicated on the schematic design drawings, provide remote indicator lamps and identification plates for detectors concealed from view. Each indicator will illuminate when the detector is in alarm. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position in the nearest common corridor or otherwise designated on the floorplans.
11. When required, the detectors shall incorporate an addressable Carbon Monoxide (CO) sensor. The CO sensor shall be selectable as an input to the multi-criteria fire detector algorithm and as an independent life-safety CO gas detector (in compliance with NFPA 720).

    a. The multi-criteria detector with CO input shall be UL 2075 compliant as a gas and vapor detector.

12. The detectors shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content and other restricted substances.

C. Heat Detectors – Addressable

1. Thermal Detectors shall be analog/addressable sensors individually programmable for either fixed temperature, rate-of-rise or combined operation, except where otherwise dictated. The thermal detector shall be Model FDT421 and have the following temperature settings:

    a. Fixed temperature at 135°F, 145°F, 155°F, 165°F, 174°F
    b. Rate of Rise at 15°F/ min at 135°F
    c. Rate of Rise at 15°F/ min at 174°F

2. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm. Each detector shall include an LED that will flash periodically to indicate an active polling cycle.

3. Analog sensors will also provide a low temperature warning (Supervisory condition) when the ambient temperature in a protected area reaches 40 degrees F.

4. Where ambient conditions dictate, provide conventional fixed temperature, weatherproof or explosion-proof heat detectors in lieu of analog detectors. Conventional devices shall be individually addressable via a dedicated addressable monitor module which shall be installed in an appropriately heated, ventilated location.

5. The detectors furnished shall have a listed spacing for coverage on smooth ceiling rating of up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage.

D. Detector Bases – Addressable

1. The plug-in detector bases shall be UL compatible with the selected detector head. They shall utilize screw clamp terminals and field circuits shall terminate directly to the base. Bases shall be installed directly on an industry standard 3 1⁄2-inch, 4-inch octagon boxes, and 4-inch square boxes (with or without plaster). Position decorative ring around the base as required per the manufacture. Provide the ability to make the detector base tamperproof to prevent the removal of the detector head without the use of a tool.
    a. The standard DB-11 base shall be - 6” version.

E. Manual Pull Stations – Addressable

1. Provide single-action addressable manual stations where shown on the schematic design drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting unique numeric address, identity, alarm and trouble to the fire alarm control panel.
    a. Station will mechanically latch upon operation and remain so until manually reset by opening with a supplied alien wrench.
    b. Stations shall be of single action pull down type with suitable operating instructions provided on front in raised or depressed letters, and clearly labeled "FIRE".
    c. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Flying lead terminals are not permitted.
    d. Surface mounted stations where indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.
2. Where shown on the schematic design drawings, provide a protective shield.
    a. Shall be constructed of a clear LEXAN shield and red frame that easily fits over manual pull stations.
    b. When shield is lifted to gain access to the station, a battery powered piercing warning speaker shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.
3. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.

F. Addressable Monitoring and Control Modules

1. Addressable Interface Devices shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These interface devices shall be able to monitor a single or dual contacts. An address will be provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive. The addressable interface modules shall be model number HTRI or FDCIO Series.
    a. The modules shall support two operation modes: an isolator (polarity sensitive) or non-isolator (polarity insensitive) mode. The module shall be capable of being wired for either mode. During the isolator mode, the built-in dual isolators will work at both sides of the module to isolate the line short in front or behind the module.
        1) Supports up to 252 addressable points per SLC devices loop, and in mixed mode up to 30 devices between isolated devices
    b. Modules shall support NFPA 72 survivability requirements for shorts and provide information as to the location of the fault.
    c. Each Model XTRI-series device has a multi-color LED that flashes when GREEN operating in Normal mode; AMBER if the unit is in a `Trouble' condition, and RED to indicate a change of status.
    d. Provide non-obstructive front-end access to programming port and wiring terminals.

G. Weatherproof Conventional Heat Detector
   1. Thermal Fire Detectors are of the rate compensation/fixed temperature type. The detector element is self-restoring after operation and is supplied in ratings of 135°F. The detector shall be epoxy coated and mounts to a weatherproof box for approved use in wet or
   2. unsheltered locations. Provide protective guards as required in public areas.

2.09 DEVICE PROGRAMMING / TEST UNIT

A. The device programming unit is a tool used for installation, commissioning, maintenance and servicing of addressable devices. It shall program the intelligent devices with the assigned addresses and provide an electronic test to ensure proper operation. Programming dipswitches and/or rotary switches shall not be acceptable. The portable unit shall provide the following features:

   1. Liquid-crystal display (LCD) screen with keypad
   2. Built in addressable base as well as two external terminals for use with all other addressable ancillary devices.
   3. Powered from on-board standard NiMH' rechargeable batteries or standard 'AA' Alkaline battery or an external AC adaptor.
   4. Reads analogue values of addressable loops and preform maintenance features such as ground fault detection.
   5. nonvolatile Flash memory with ability to download software upgrades.

B. The equipment supplier shall furnish a device programming unit to the installer for the duration of the project.

2.10 NOTIFICATION APPLIANCES

A. General requirements: Provide combination or individual audible and visual notification appliances as shown and permitted. All appliances shall be direct-wired; devices that utilize a multi-part assembly with swipe or non-mechanical pressure-type contact connections will not be considered acceptable.

   1. Appliance housing available in red or white.
   2. All field adjustments shall not require special tools or programming software for setting changes.

      a. The selector switch for selecting the candela shall be tamper resistant.

   3. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes
   4. The contractor shall provide fitted surface mount backboxes supplied by the appliance manufacturer and outdoor-rated appliances where site conditions dictate.
   5. wall or ceiling-mount applications.
   6. 24VDC operation, operating by reverse-polarity.
   7. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation.
   8. Provide surface or semi-flush installations
   9. Provide weather-proof appliances as shown on the drawings

      a. Extended temperature range of –40°F to 150°F (-40°C to 66°C).
      b. Listed for outdoor applications under UL 1638 as well as under UL 1971

B. Audible Horn Appliances:

a. Evacuation signal shall be the ANSI 53.41 three-pulse temporal pattern. Sleeping areas shall have low-frequency 520 Hz audible signals.

1) Horns shall be UL Listed (for indoor use under Standard 1971 and 464).
2) High and Low audible outputs (90 & 95 dB)
3) Selectable temporal or steady horn output.

b. Provide high output re-entrant-type speakers with the appropriate weatherproof listings in outdoor or other high ambient noise areas, as shown on the schematic design drawings.

C. Visual Strobe Appliances:

a. Visual-notification appliances shall meet and be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service.
b. Strobe shall be listed for indoor use, and shall meet the requirements of FCC Part 15 Class B.
c. Ability to mix LED and xenon strobes in the same field of view
d. LED multi-candela strobe shall have field-selectable settings, and be rated per UL Standard 1971 for:

1) Wall-mount: 15/30/75/110cd
2) Ceiling mount: 15/30/75/95cd or 115/177cd

2. The LED portions of the strobes shall meet the 20 millisecond light-pulse duration requirements of the 2016 edition of NFPA 72.

3. All inputs shall be compatible with standard, reverse polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP)

4. The selector switch for selecting the candela shall be tamper resistant

5. The strobes shall not drift out of synchronization at any time during operation

a. If the sync module or Power Supply fails to operate, (i.e. - contacts remain closed), the strobe shall revert to a non-synchronized flash rate

2.11 DIGITAL COMMUNICATOR – CELLULAR TECHNOLOGY

A. The commercial fire alarm off-site communicator shall provide general (alarm/ trouble/ supervisory) and ability for contact/ grouped event ID reporting from the fire alarm control panel (FACP). It shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remove Receiving Station. It shall offer three selectable reporting paths which include: Cellular only, IP only, or IP primary/cellular backup. The Comminutor shall receive it's power and supervision from the FACP. Additional requirements:

1. Provide cellular communications for this project with IP communication as owner selected/provided future option.
2. Operates over the following communication protocols:

a. HSPA+ (4G)
b. HSPA (HSDPA &HSUPA) + (3G)

c. EDGE (2G GPRS) (2G).

3. Selectable reporting paths and supervision intervals to meet NFPA 72, chapter 26 requirements.
4. Cellular provide capability: With broadest coverage footprint available in Verizon Network Certified™ or AT&T networks.
5. Works over any type of customer provided Ethernet 10/100 based network connection (LAN or WAN), DSL modem or cable modem.
6. Supports both dynamic (DHCP) or Public and Private Static IP addressing.

B. Cellular communication shall be the primary means of communication to the off-site monitoring station, per NFPA 72 requirements. The equipment shall also support IP communications abilities with this project for future owner usage.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Perform work in accordance with the requirements of NFPA 70, NFPA 72, NFPA 13, NFPA 2001, and NECA , Standard of Good Workmanship in Electrical Contracting.

B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

C. In the event that limited energy cable installation is allowed, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3 feet and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.

D. Backing Boards: Provide 3/4-inch marine plywood backing boards for support of all fire alarm equipment panels surface mounted on masonry walls.

1. Paint both sides of boards with two (2) coats of Gray enamel, including all edges.

E. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

F. Wiring Integrity and survivability requirements – Specified on shop drawings per NFPA72, Chapter 12

G. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

H. Provide Surge Protection Devices (SPD) on all fire alarm wiring, which extends beyond the main building. Locate the SPD as close as practicable to the point at which the circuit leave or enter the building where the Fire Alarm Control Panel is located. Protection devices shall be

shown on the schematic design drawings and shall be UL listed or in accordance with written manufacturer's requirements.

1. Provide equipment ground and connected to the building grounding electrode system per NEC.
2. Provide a dedicated enclosure to house the SPD and label it.

I. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

J. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120V AC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.03 BOXES, ENCLOSURES AND WIRING DEVICES

A. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

B. Fire Alarm: Terminal cabinets shall be provided in locations shown and as otherwise required to support wiring terminations, troubleshooting and future tenant fit-up. Cabinets shall be painted red and contain terminal blocks to support the system wiring where the Control Panels are remote from the devices served. Cabinets shall include accommodation for all wiring including SLCs, notification circuits, and related addressable and fault isolation modules for future expansion and modification.

1. Terminal boxes and cabinets shall have a volume 50 percent greater than required by the NFPA 70. Minimum sized wire shall be considered as 14 AWG for calculation purposes.

C. Boxes shall be installed plumb and firmly in position.

D. Extension rings with blank covers shall be installed on junction boxes where required.

E. Junction boxes served by concealed conduit shall be flush mounted.

F. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

G. "Fire alarm system" decal or silk-screened label shall be applied to all junction box covers.

H. Panel enclosures shall be installed to meet clearance requirements per NFPA 70 and local codes. Minimum requirements shall be 3 foot clearance in front of the enclosure

3.04 CONDUCTORS

A. Each conductor shall be identified as shown on the shop drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.

C. All splices shall be made using solder-less connectors. All connectors shall be installed in conformance with the manufacturer recommendations.

D. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

E. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

F. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.05 DEVICES

A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

C. All devices and appliances shall be mounted to or in an approved electrical box.

3.06 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Permanently label or mark each conductor with alphanumeric wire markers at the main control panel, transponders, terminal cabinet and NAC booster panels.

C. A consistent color code for fire alarm system conductors throughout the installation.

3.07 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Testing General:

1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.

2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.

3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the schematic design drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.

4. Test reports shall be delivered to the acceptance inspector as completed.

5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:

a. Ladders and scaffolds as required to access all installed equipment.

b. Multi-meter for reading voltage, current and resistance.

c. Two-way radios and flashlights.

d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.

e. Decibel meter

f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the authority having jurisdiction.

3.08 ACCEPTANCE TESTING

A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared by the engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

1. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.
2. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.

B. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

1. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
2. Visually inspect wiring.
3. Test the battery charger and batteries.
4. Verify that software control and data files have been entered or programmed into the FACP.
5. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
6. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
7. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
8. Megger Tests: After wiring has been installed, and prior to making any connections to panels or devices, wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors with 300 volt rated insulation shall be tested at a minimum of 250 VDC. Conductors with 600 volt rated insulation shall be tested at a minimum of 500 VDC. Test results recorded for use at the final acceptance test.
9. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.
10. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
11. Test each initiating device and notification appliance and circuit for proper operation and response at the control unit. Smoke sensors shall be tested in accordance with

manufacturer's recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors shall comply with the requirements of NFPA 72 except that, for item 12(e) (Supervision) in Table 14.4.2.2, disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision shall be tested at each device.

12. All readings for Sound Pressure Level (SPL) shall be recorded on the installation drawings next to the speaker symbol. The readings shall then be added on the "as-Built" drawings to be submitted at the conclusion of the Final Acceptance test.
13. Verify with all parties the required survivability of wiring, raceways, and junction boxes
14. Determine that the system is operable under trouble conditions as specified.

C. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 30 calendar days prior to the test date. A final acceptance test will not be scheduled until the Preliminary Testing has been completed.

1. Provide documentation of Preliminary Testing results.
2. Test the system in accordance with the procedures outlined in NFPA 72 acceptance testing.
3. Demonstrate the performance of the required number and type of initiating devices and notification appliances per the AHJ's requirements.
4. Verify that Shop Drawings reflecting as-built conditions are accurate. Upon final approval by all parties, provide two sets of AS-built documents in a cabinet adjacent to the main FACP or designated area within the building. Per NFPA 72 7.7.2Measure the current in Notification appliance circuits under full load to assure that there is the calculated spare capacity for every circuit.

D. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
    a. Open, shorted and grounded signal line circuits.
    b. Open, shorted and grounded notification, releasing circuits.
    c. Primary power or battery disconnected.
2. System notification appliances shall be demonstrated as follows:
    a. All alarm notification appliances actuate as programmed
    b. Audibility and visibility at required levels.
3. System indications shall be demonstrated as follows:
    a. Correct message display for each alarm input at the control display.
    b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
    c. Correct history logging for all system activity.

4. System off-site reporting functions shall be demonstrated as follows:
    a. Correct zone transmitted for each alarm input
    b. Trouble signals received for disconnect
5. Secondary power capabilities shall be demonstrated as follows:
    a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
    b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
    c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.09 DOCUMENTATION

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
    1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM or memory stick (thumb drive) with digital copies of the record drawings in PDF format.
    2. System operation, installation and maintenance manuals.
    3. System matrix showing interaction of all input signals with output commands.
    4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
    5. System program showing system functions, controls and labeling of equipment and devices.

3.10 PROTECTION

A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.11 DEMONSTRATION

A. Include in the project the services of a factory-trained instructor, regarding the system operations, inspection requirements, and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, and operation of the fire alarm system.
    1. Required Instruction Time: Provide 2 hours of instruction after final acceptance of the system. The instruction shall be given during working hours on such dates and times as are selected by the owner. The instruction may be divided into two periods and videotaped at the discretion of the owner.

B. Provide a printed instruction card in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble.

END OF SECTION 283111

SECTION 285000 - SECURITY MANAGEMENT SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Union County has an existing enterprise level OSSI Intelli Site Security Manaement System (SMS). The new garage shall be integrated into the county's existing system using compaitble components and software. The garage shall have a system capable of operation in standalone mode as well as remote operation from the County's command center. The SMS shall integrate with the new door hardware, card readers, and parking gate controls.

1.2 CONDITIONS AND REQUIREMENTS

1.1 The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.3 SECTION INCLUDES

A. General description, functional requirements, operational characteristics, and criteria for the Security Management System (SMS).

1.4 RELATED SECTIONS

A. Division 26 - Electrical: Electrical systems and components.

B. Section 28 05 13 - Conductors and Cables for Electronic Safety and Security.

1.5 DEFINITIONS

A. API: Application Programming Interface.

B. LDAP: Lightweight Directory Access Protocol.

C. NTSC: National Television Standards Committee.

D. PAL: Phase Alternating Line. PAL is the color video standard used in Europe and many other countries.

E. SMS: Security Management System.

1.6 REFERENCE STANDARDS

A. Where more than one (1) reference standard, code, or regulation applies, the more stringent one shall govern.

B. Electronic Industries Alliance (EIA):

1. EIA RS-170 - Standard for Composite Video Signals.

1.2 European Union (EU):

1. Restriction of the Use of Certain Hazardous Substances (RoHS) in Electronic Equipment Regulations 2002/95/EC.

1.3 Federal Communications Commission (FCC).

1. FCC Part 15 - Unlicensed RF Devices.

2. FCC Part 68 - Requirements for Connecting to the U.S. Phone Network.

1.4 Institute of Electrical and Electronics Engineers, Inc. (IEEE).

1.5 International Organization for Standardization (ISO).

1.6 International Radio Consultive Committee (CCIR).

1.7 Microsoft® Open Database Connectivity (ODBC) Interface.

1.8 National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

1.9 National Institute of Standards and Technology (NIST):

1. Federal Information Processing Standards Publication (FIP PUBS 197) - Specification for the Advanced Encryption Standard (AES).

1.10 National Television Standards Committee (NTSC):

1. Color Camera Broadcast Standard.

1.11 Underwriters Laboratories Inc. (UL):

1. UL 294 - Standard for Access Control System Units.

2. UL 1076 - Standard for Proprietary Burglar Alarm Units and Systems.

3. UL 1981 - Standard for Central-Station Automation Systems.

1.7 SECURITY MANAGEMENT SYSTEM (SMS) DESCRIPTION

A. The Security Management System (SMS) outlined in this section is the key central component for managing physical security and the bridge between physical and logical security for a project. The system shall provide a variety of integral functions including: regulation of access and egress; provision of identification credentials; monitor, track and interface alarms.

B. The SMS shall utilize a single seamlessly integrated relational database for all functions utilizing a fully multi-tasking multi-threading Microsoft Windows 10 or Server Operating

System. The SMS shall be written so that all system modules (access control, alarm monitoring, ID or credential management, visitor management, asset management and digital video management) are developed and built from a unified single 32-bit source code set. Separate source code bases for individual modules of the SMS are not acceptable.

C. Upgrades or expansion of the SMS to a larger size system in scale shall not require installation of a different and/or new SMS application or require the administrator or operator to learn a different and or new interface from the previous version.

D. The SMS shall be written using Unicode format. Unicode enables a single software product to be targeted across multiple platforms and languages without re-engineering and allows for data to be transported through different systems without corruption.

E. The SMS shall be compatible with Microsoft Windows 10, and shall have passed Microsoft-designed tests for compatibility and reliability on Windows 10.

F. The SMS shall be UL 1076 Listed.

G. The SMS shall have FIPS 140-2 certification.

H. The SMS shall only require a single license key to be present on the database server for the SMS to operate. The license key shall either be a physical device or a software license key. The SMS shall allow the SMS USER the ability to activate, return, or repair the software license key. The software license shall only be used on a physical computer or in a VMware virtual environment. License keys shall not be required at the client workstations. The license key on the database server shall determine the number of client workstations that shall be able to connect to the SMS as well as all SMS functionality. An alarm shall be generated in the SMS's Alarm Monitoring application as the license expiration date approaches.

I. The License Administration login and password shall be encrypted when they are passed to the License Server. The hash shall not be the same data even with the same logon credentials on different systems. This is a requirement for U.S. government DIACAP certification.

J. The SMS shall support concurrent licensing with respect to client licenses. The SMS shall be installed on any number of client workstations in the CUSTOMER facility. Then, any of the client workstations that have the SMS software installed shall have the ability to connect to the database server as long as the maximum number of concurrent connections purchased has not been reached. Connections shall be licensed on a per module basis. This shall provide CUSTOMER with great flexibility in system design and layout.

K. The SMS shall provide support for single sign-on capability. Single sign-on shall allow System Administrators or System Operators to authenticate into SMS applications using their Windows domain account.

L. Single sign-on shall support the following scenarios:

1. Allow System Administrators or System Operators to interactively run SMS applications without having to enter a username or password. This shall make administration of the SMS easier since maintenance of separate SMS usernames and passwords is not required.

2. Allow SMS API scripts to authenticate. These scripts shall be run using a Windows account allowing a seamless and secure way to authenticate the account and restricting the script to those actions that the user is permitted to perform.

3. The SMS shall be able to seamlessly interface with and monitor intelligent system controllers, reader interface modules, I/O panels, alarm panels, and alarm panel receivers.

4. The SMS shall be able to communicate with intelligent system controllers via RS-485, RS-232, TCP/IP or Ethernet, and dialup via modem.

5. Tasks shall be accessible from any compatible client workstation on the network utilizing one (1) or all of the following:

6. Traditional client-server architecture.

7. N-tier architecture where the SMS supports the expansion of the system architecture and allows for user deployment based upon their system architectural needs. The SMS shall allow for, but not require, the separation of the database, application server, Web server, and client interface. The system shall require that all connections to the database be performed through a trusted link from the client or internet browser interface.

8. Utilize an open architecture where all data must reside on a single database and must be accessible in real time to SMS workstation or Web-based client connected to the network. The system shall be configurable to support all of the following databases: Microsoft SQL Server 2008, Microsoft SQL Server 2005, Oracle Server 11g, and Oracle Server 10g. Oracle data may reside on Windows or UNIX platforms.

9. The SMS shall support:

10. OSSI Intelli Site.

1.8 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings.

1. Manufacturer’s technical data for all material and equipment at the system and sub system level to be provided as part of the SMS.

2. A system description including analysis and calculations used in sizing equipment required by the SMS. The description shall show how the equipment will operate as a system to meet the performance requirements of the SMS. The following information shall be supplied as a minimum:

3. Server(s) processor(s), disk space and memory size.

4. Description of site equipment and its configuration.

5. Network bandwidth, latency and reliability requirements.

6. Backup or archive system size and configuration.

7. Start up operations.

8. System expansion capability and method of implementation.

9. System power requirements and UPS sizing.

10. Device or component environmental requirements (cooling and or heating parameters).

11. A description of the operating system and application software.

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work.

1. Indicate all system device locations on architectural floor plans. No other system(s) shall be included on these plans.

2. Include full schematic wiring information on these drawings for all devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at device.

3. Include a complete SMS one-line, block diagram.

4. Include a statement of the system sequence of operation.

1.12 Operation and Maintenance Data: For electronic security system to include in emergency, operation, and maintenance manuals, include the following:

1. Provide [3] sets electronic format manuals including operating instructions, maintenance recommendations and parts list including wiring and connection diagrams modified to reflect as-built conditions.

2. Manuals: Deliver final copies of the manuals within [14] days after completing the installation test. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of the Contractor responsible for the installation and maintenance of the system and the factory representatives for each item of equipment for each system. The manuals shall have a table of contents and labeled sections. The final copies delivered after completion of the installation test shall include all modifications made during installation, checkout, and acceptance testing. The manuals shall consist of the following:

3. Functional Design Manual: Identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. Include a description of hardware and software functions, interfaces, and requirements.

4. Hardware Manual: Describe equipment furnished including:

5. General description and specifications.

6. Installation and check out procedures.

7. Equipment layout and electrical schematics to the component level.

8. System layout drawings and schematics.

9. Alignment and calibration procedures.

10. Manufacturer's repair parts list indicating sources of supply.

11. Software Manuals: Describe the functions of software and include all other information necessary to enable proper loading, testing, and operation. The manual shall include:

12. Definition of terms and functions.

13. System use and application software.

14. Initialization, startup, and exit.

15. Reports generation.

16. Details on forms customization and field parameters.

17. As-Built Drawings: During system installation, the Contractor shall maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the SMS to be used for record drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the SMS. Copies of the final as-built drawings shall be provided to the end user in DXF format.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. SMS manufacturer shall be an established organization with referenced and documented experience delivering and maintaining SMS of equal or higher sophistication and complexity as compared to the system detailed in this specification.

2. SMS manufacturer shall employ at a minimum the following methods for quality assurance of component and assembly devices.

3. Perform visual inspection of devices to verify assembly according to defined procedures. Perform end of line operational tests to ensure product functionality has been correctly configured.

4. Perform individual functionality and system level regression testing to ensure compliance with product specifications. Perform single and multiple unit system tests to mimic end-user installation configurations. Utilize automated hardware and software testing to evaluate system performance under published operational loads and compare to published system capabilities.

B. Bidder Qualifications:

1. At the time of the bid, the bidder shall have satisfactorily completed projects of a similar size, scope and complexity as the system detailed in this specification. The bidder shall furnish written proof of experience from three (3) references and proof of current accreditation or certification by the manufacturer for required training for sales or installation or service of the SMS and associated devices.

2. The bidder shall also be a factory authorized local service organization that shall carry a complete stock of parts and provide maintenance for the SMS and related systems under this contract. Local shall be defined as an area in a (50) mile radius of installed location.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging.

B. Store components and equipment in temperature and humidity controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 degrees Fahrenheit (10 and 29.4 degrees Celsius), and not more than 80 percent relative humidity, non-condensing.

C. Open each package; verify contents against packing list; and file copy of packing list, complete with package identification, for inclusion in operation and maintenance data.

D. Mark packing list with the same designations assigned to materials, components, and equipment for recording in the system labeling schedules that are generated by software.

E. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.11 SEQUENCING

A. New access control system and peripheral equipment shall be installed prior to the removal of the existing Kerri MS security managamenet system. The installaer shall coordinate insidvidaul door cut over to new system with county personnel.

1.12 TRAINING

A. Provide 3-day certification training for (2) county sheriff’s office personel at OSSI facility. Include cost for travel and boarding as necessary.

B. Provide OSSI certified technician on site for (7) days to facilitate proximity card issuance and migration of card holder data base. Schedule to be coordinated with county.

C. Provide (2) 4 hour trainings sessions on site for OSSI security management system and peripheral equipment at completion of installation. Schedule to be coordinated with county.

1.13 Provide (2) 4 hour trainings sessions on site 120 days post construction for OSSI security management system and peripheral equipment. Schedule to be coordinated with county.

PART 2 - PRODUCTS

1. WARRANTY

B. SMS manufacturer warrants that the product disc and hardware key shall be free from defects in material and workmanship and that SMS software product will function in substantial accordance to SMS manufacturer's specifications. Any defective dongle will be replaced at no charge provided that the system is currently on a supported version of SMS software.

C. All SMS manufacturer branded access control hardware. SMS manufacturer warrants that such products will be free from defects in material and workmanship and that they will operate in general accordance with their product specifications. The parts will be repaired or replaced at the manufacturer's option. SMS manufacturer provides repair or replacement of SMS manufacturer branded components for five years.

D. Transfer SMS third-party device warranties from the manufacturer to the Contractor, which may then transfer third-party warranties to the Owner. Examples may include but not be limited to: credential printers, reader heads, computers, etc.

E. SMS products and perifpheral equipment located at doors shall include a 2 year installation warranty for all equipment and wiring associated with installation. The contractor shall provide a quarterly cleaning and maintencance of the system components in coordination with county personnel.

1. MANUFACTURERS

2.2 Basis-of-Design Manufacturer: The security management system is based on products of OSSI; Web site: www.OSSI-usa.com.

A. Substitutions will not be considered.

2.3 SMS SOFTWARE

A. Security Management System (SMS) Software: OSSI "Intelli Site".

2.4 SMS FIELD HARDWARE

A. Security Management System (SMS) Hardware: The SMS shall be equipped with the access control field hardware required to receive alarms and administer all access granted or denied decisions. All field hardware must be designed to meet UL 294 requirements. The SMS must be able to retrieve device serial numbers from all field hardware, excluding card readers. Depending upon the configuration, the SMS field hardware must be able to include any or all of the following components:

1. Intelligent Reader Module (IRM)

2. Intelligent Input Module (IIM)

3. Input Relay Module (IRM)

4. Network Adapters

5. Power supplies and enclosures

6. UL, CUL, and CE listed power supplies and enclosures

B. SMS Authentication Hardware:

1. HID SmartID Reader

2. HID Proximity Readers

3. HID Wiegand Readers

4. HID iCLASS credential readers

2.5 SMS WORKSTATION HARDWARE

A. CPU: Intel Core Series I5 – current generation

B. RAM: 8GB minimum

C. HDD: 500GB SATA III

D. Display: 24” 1080p minimum

E. Input devices: keyboard, mouse

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of electronic security system.

B. Examine rough-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before electronic security system installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INTEGRATION

A. Integrate electronic security system with the following systems and equipment:

1. Electronic door hardware.

2. Elevators – valid card read required to access courts facility judges elevator.

3. Access control.

4. Fire-alarm system.

3.3 INSTALLATION

A. Install electronic security system in accordance with manufacturer's written instructions.

B. Wiring Method: Install wiring in metal raceways, except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2-inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.

END OF SECTION 285000

SECTION 311000 – SITE PREPARATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Site demolition:

a. Selective site demolition: Demolition of pavements, curbs and gutters, and utilities, and backfilling voids resulting from removals or demolition.

2. Site Clearing:

a. Removing Above-Grade and Below-Grade Improvements
b. Soil Erosion and Sedimentation Control

1.2 RELATED DOCUMENTS:

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 00 and 01 Specification Sections, apply to this Section.

B. Somerset-Union Soil Erosion and Sediment Control Plan Certification and NJDEP 5G3 Permit.

C. The Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition, January 2014, revised July 2017.

D. Related Sections:

1. Section 312000 – Earth Moving

1.3 SUBMITTALS

A. Product Data: Silt fence.

B. Contractor shall prepare an accurate record of actual locations of capped and abandoned utilities and subsurface obstructions.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to applicable local code for demolition of structures, safety of adjacent structures, dust control and runoff control.
2. Obtain required permits and licenses from authorities. Pay associated fees including disposal charges.
3. Notify affected utility companies before starting work and comply with their requirements.
4. Do not close or obstruct roadways, sidewalks or hydrants without permits.
5. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

6. The Contractor shall keep a copy of the Soil Erosion and Sediment Control Plan on-site at all times throughout the construction period.

B. In addition to complying with all pertinent codes, the Contractor will also comply with the requirements of those insurance carriers providing coverage for existing structures and this work.

1. Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling disposal regulations of authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Existing Conditions:

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.
2. Notify Owner of variations to conditions or discrepancies in actual site conditions prior to start of site preparation Work.

B. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

C. Existing Utility Services:

1. General: Indicated locations are approximate; determine exact locations before commencing Work.
2. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain before starting this Work.
3. Place markers to indicated location of disconnected services. Identify service lines and capping locations on Project Record Documents.

D. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Restore damaged improvements to their original condition, as acceptable to property Owners.
2. Provide protection for safe passage of persons around area of site preparation. Take precautions and conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

E. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.

F. Obtain and pay for permits required for the execution of the Work.

G. Notify corporations, companies, individuals, and local authorities owning conduits, wires, or pipes that will be affected by this Work. Arrange for removal and relocation of wires running to or on the property that will interfere with the execution of the Work.

H. Verify actual locations of underground structures. Protect and maintain conduit, drains, sewers, pipes, and wires that are to remain. Provide and maintain markers for location of underground facilities.

I. Contractor shall be responsible for maintaining all safety precautions in accordance with local and state laws and regulations to ensure the safety of the workers and general public.

J. Contractor shall be responsible for maintaining dust control throughout the demolition and site clearing operations.

1.6 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill Materials - Specified in Section 312000 – Earth Moving.

B. Soil Erosion and Sedimentation Control – Refer to Construction Plans and Soil Erosion and Sediment Control Certification.

1. Silt fence, inlet sedimentation protection, and construction entrance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 SITE DEMOLITION

A. Utilities

1. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

a. Owner’s Representative will arrange to shut off indicated utilities when requested by Contractor.
b. Arrange to shut off indicated utilities with utility companies.

2. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

    a. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
    b. Do not proceed with utility interruptions without Owner's Representative's written permission.

3. Excavate for and remove underground utilities indicated to be removed. Remove or abandon existing storm or sanitary sewers indicated to be removed in accordance with local MUA requirements.
4. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.

B. Site Improvements

1. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
2. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

    a. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3. Removal of rock.
4. Removal of debris.

    a. Remove all debris from the site.

C. Pollution Controls:

1. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

    a. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

    a. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

D. Salvage Materials:

1. All demolished material shall be offered to the Owner. If not desired by the Owner, materials shall become property to be removed from site and disposed of by the Contractor at his expense unless noted otherwise on the Drawings.

2. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain to the Owner. Notify the Owner's representative if items are encountered and obtain acceptance regarding method of removal and salvage for the Owner.

3.3 SITE CLEARING AND GRUBBING

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated.

3.4 BACKFILLING

A. Completely fill below grade areas and voids resulting from demolition or removal of structures (including underground) using approved select fill materials consisting of stone, gravel, and sand free from debris, trash, frozen materials, roots, and other organic matter.

1. Fill depressions caused by clearing and grubbing operations with acceptable fill material to subgrade elevation.
2. Ensure that areas to be filled are free of standing water, frost, frozen, or unsuitable material, trash, and debris prior to fill placement.
3. Place fill materials in horizontal layers and compact each layer at optimum moisture content of fill material to proposed density as specified in Section 312000 – Earth Moving.
4. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.5 REMOVAL

A. Remove debris, rock, extracted plant life, paving, curbs, and other structures indicated on Drawings and as specified.

B. Disposal of Demolished Materials:

1. Remove from site debris, rubbish, and other materials resulting from demolition operations.
2. No burning of any material, debris, cleared material, or trash on-site or off-site will be allowed.
3. Transport cleared and demolished materials with appropriate vehicles and dispose off-site to areas which are approved for disposal by governing authorities and appropriate property owners. Do not burn or bury waste materials on-site.

C. Remove grass, trees, plant life, stumps and all other construction debris from site to a dump site that is suitable for handling such material according to state laws and regulations.

3.6 SOIL EROSION AND SEDIMENTATION CONTROL

A. Sequence of Construction Activities

1. The City of Elizabeth Department of Engineering must be notified in writing 48 hours prior to commencement of any construction activity. A copy of the certified plan must be kept on the job site at all times.

2. Contractor shall install silt fence, snow fence tree protection, inlet sediment filters, and stabilized construction access, as part of initial phase of any work to insure maximum silt retention on-site. Soil Erosion and Sediment Control measures shall be installed as indicated on Drawings and in conformance with The Standards for Soil Erosion and Sediment Control in New Jersey, latest edition.
3. Mass grade the site, keeping disturbed areas to a minimum at all times. All soil to be exposed or stockpiled for a period of greater than 14 days, and not under active construction, will be temporarily seeded and hay mulched or otherwise provided with vegetative cover. This temporary cover shall be maintained until permanent protection is established.
4. Contractors shall control mud accumulation on all streets surrounding project by installing stone surface at all locations where construction traffic leaves the site. Dust shall be kept to a minimum by utilizing sprinkling, calcium chloride, vegetative cover, spray on adhesives, or other approved methods.
5. Maintain all filters and traps during construction to prevent any blockages from accumulated sediment. Clean sediment traps, filters, and fencing after each storm event and on a weekly basis. Replace all materials that are clogged or ineffective.
6. As storm sewer lines are installed, Contractor is to install a silt barrier at each inlet.
7. Temporary erosion control and sediment controls shall be removed by the Contractor only when sufficient growth of ground cover is established to prevent further erosion.
8. The contractor must request a final inspection once landscaping and final soil stabilization is complete and obtain a Report of Compliance. The contractor shall provide any additional erosion controls as directed by the City of Elizabeth Department of Engineering and / or Somerset-Union Soil Conservation District upon final inspection and as required for a Report of Compliance.

3.7 MONITORING

A. Contractor shall monitor soil erosion control practices at least weekly to determine the effectiveness of the installation any repairs required. Any damage incurred by erosion shall be rectified immediately. Contractor shall keep a detailed log of these observations and remedies taken. Log shall be submitted monthly.

B. Contractor shall clean-out siltation features when siltation reduces capacity by 20 percent.

END OF SECTION 311000

SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide all materials, labor, equipment, and services and perform all operations in connection with the Excavating, complete, in accordance with the Drawings and Specifications, and including but not limited to, the following:

1. Excavating and backfilling for site utilities.
2. Excavation Support and Protection and removal when no longer needed.
3. Onsite and imported fills as necessary to bring areas to elevations indicated on the Drawings.

B. All excavation shall be considered unclassified.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract.

B. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

C. Related sections:

D. Section 311000 – Site Clearing

E. Section 312316 – Trenching

F. Section 312323 – Backfill

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered above subgrade elevations indicated and the disposal, on-site, of materials removed.

B. Subgrade: The surface or elevation remaining after completing excavation, or the top surface or a fill or backfill immediately below sub base, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site for use as backfill or fill.

D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.

E. Base Course: The layer placed between the sub base course and surface pavement in a paving system.

F. Bedding Course: Layer placed over the excavated subgrade in a utility trench before placement of pipe.

G. Drainage Fill: Course of 3/4-inch size clean crushed stone supporting slab-on-grade placed to minimize upward capillary flow of perched water.

H. Unauthorized excavation consists of removing materials below indicated subgrade elevations or dimensions without direction of the Owner's Representative. Unauthorized excavation, as well as remedial work not directed by the Owner's Representative, shall be at the Contractor's expense.

I. Structures: Buildings, footings, piles, pile caps, foundations, retaining walls, slabs, tanks, curbs, encasings, cradles, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

J. Utilities include underground pipes, conduits, ducts, and cables, as well as underground services five feet beyond the face of the exterior building wall lines.

K. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾ c.y. or more in volume.

L. Additional Excavation: If unsatisfactory soil materials are encountered at design elevations, continue excavation as directed by Owner's Representative. If conditions are not a result of Contractor's negligence, additional excavation will be measured as directed by Owner's Representative and paid for in accordance with contract conditions relative to changes in work.

1.4 PROJECT CONDITIONS

A. EXISTING UTILITIES: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

a. Existing sub-surface structures, including old sewers, abandoned drains, etc., which may appear within the limits of excavation, shall be removed if required, but such removals will not be paid for separately, being included in the price paid for excavation or other items including such excavation.
b. In case the uncovering or interference of sub-surface structures necessitates a change in the alignment or grade of the proposed work, the Contractor shall give written notice of such condition, and shall cease work at such points until ordered to proceed.
c. In case any change of grade or alignment shall serve to delay the work, the time allowed for completion of the contract will be extended by the same length of time to which the delay shall have operated, the decisions of the Owner's Representative, being final.

2. All excavation, trenching and shoring operations must be conducted in accordance with the State of New Jersey Occupational Safety and Health Standards for the Construction Industry (with recent amendments) and in accordance with 29 CFR Part 1926, Occupational Safety and Health Standards – Excavations; Final Rule (October 31, 1989), and recent amendments. The selection of appropriate temporary slope angles is the responsibility of the Contractor who is on-site full time and is responsible for construction operations and safety. In selecting temporary slopes, the contractor should consider the type of materials excavated, groundwater and seepage conditions, the presence of construction equipment, and other surcharge loads near the top of the excavation, the excavation depth, and the slope and conditions of the bedrock. It is expected that the natural soils and existing fill materials can be excavated with

conventional equipment and that excavations into the bedrock will require special considerations to facilitate rock removal.

3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Owner's Representative and then only after acceptable temporary utility services have been provided.

   a. Provide minimum of 48-hour notice to Owner's Representative and receive written notice to proceed before interrupting any utility.
   b. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
   c. The use of explosives is not permitted.

1.5 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring as part of this work and post with warning lights.

B. Operate warning lights as recommended by authorities having jurisdiction.

C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

D. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

E. Protect trees, shrubs, lawns, and other features remaining as portions of final landscape.

F. Use all means necessary to protect the building, neighboring property, and materials that are to be salvaged. This protection shall be given to public walks, streets, and utilities. Any damage to same shall be repaired by Contractor at his expense.

PART 2 - PRODUCTS

2.1 SUBBASE MATERIALS

A. Subbase and base materials shall be naturalized or artificially graded mixture of natural or crushed gravel, crushed stone, natural or crushed sand; ASTM D2940, with at least 95 percent passing a 1½-inch sieve and not more than 8 percent passing a No. 200 sieve.

2.2 FILL MATERIALS

A. Fills shall be constructed from approved materials found on or off site.

B. All fill material, unless noted otherwise herein, shall be a clean fill material free of debris and organic matter. Material shall be free of rock, stone, or broken concrete larger than 2 inches in the largest dimension. All imported fill material shall be "certified clean."

2.3 GRANULAR FILL MATERIAL

A. Granular fill materials shall be bank run gravel or sand, or processed stone which meets the gradation criteria of the Unified Soil Classification System for Well Graded, Silty Gravel (GM), Gravel (GW) or sand (SW or SM). Maximum particle size shall pass a 3-inch sieve.

B. The material shall contain more than 5 percent but less than 15 percent silt passing the No. 200 sieve and shall have a maximum plasticity index of six (6). All granular fill material is subject to the continuing inspection and acceptance of the Owner and Engineer.

2.4 TOPSOIL

A. Topsoil shall be natural fertile friable loamy soil from a well-drained site, free of coarse sand, weeds, roots, and any sticks, stones, or other extraneous matter over 1 inch in size. Landscape Engineer shall approve topsoil in advance of delivery to the site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structure, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperature or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. All filling operations requiring compaction shall be observed by a qualified soils/geotechnical engineer with field density tests made, to assure compaction to Specification.

3.2 DEWATERING

A. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction, and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Convey water removed from excavations and rainwater to collecting or runoff areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.3 STABILITY OF EXCAVATIONS

A. Comply with the applicable provisions of the Occupations Safety and Health Administration Standards and Interpretations (OSHA), including Amendments and requirements of authorities having jurisdiction to maintain stable excavations.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 APPROVAL OF SUBGRADE

A. Notify Owner's Representative when excavations have reached required subgrade.

B. When Owner's Representative determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner's Representative.

D. Contractor shall examine all surfaces to receive geotextile for compliance with requirements for soil compaction and grading and to ensure that all subgrades are free from sharp projections and voids; for subgrade free from angular rocks, rubble, roots, vegetation, debris, voids, protrusions, and ground water; and for other unsuitable conditions that could adversely affect the performance of or otherwise damage the geotextile.

E. Excavate and replace pockets of weak, soft, or pumping soils and all areas of unsuitable subgrade conditions with granular fill. The surface of the subgrade shall be smooth and level.

F. Proceed with geotextile installation only after unsatisfactory conditions have been corrected and the Owner's Representative has documented in writing that the subgrade is satisfactory to receive geotextile.

G. Contractor shall be responsible to properly repair or replace all damaged geotextile.

3.5 BACKFILL

A. Place and compact satisfactory soil material in layers to required elevations. Use soil material free of: clay, rock, or gravel larger than 3 inches in any dimension, debris, vegetable matter, waste, and frozen materials. Use subbase material where indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.

B. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finish grade including, where applicable, damp-proofing and perimeter insulation.
2. Removal of trash, debris, mud, slough, and water from excavation
3. Removal of temporary shoring and bracing, and sheeting.

3.6 FILL

A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

1. Plow scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

B. Subgrades or existing ground surfaces to receive fill shall be proofrolled. Soft/unstable areas shall be removed and replaced with compacted satisfactory fill material.

3.7 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
3. Remove and replace or uniformly moisten soil material that is too dry to compact to specified density.
4. Stockpile or spread and dry/moisten removed wet/dry satisfactory soil material.

3.8 COMPACTION

A. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment and not more than 8 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

C. Percentage of Maximum Dry Density Requirements: Compact soil to the following percentages of maximum dry density according to ASTM D 1557.

1. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

3.9 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

3.10 PROTECTION

A. Protection Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or loose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace material to depth directed by the Geotechnical Engineer; reshape and recompact at to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with addition approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Excavated materials shall be redirected on-site and properly graded or legally removed off-site to a disposal area, at the Contractor's expense. Material removed off-site shall be properly documented and manifested.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Owner's Representative.

END OF SECTION 312000

SECTION 312316.13 – TRENCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating trenches for utilities as shown on plans.

B. Compacted fill from top of utility bedding to subgrade elevations.

C. Backfilling and compaction.

1.2 RELATED DOCUMENTS

A. Section 312000 – Earth Moving.

B. Section 322323.13 – Backfill.

C. Section 334000 – Storm Drainage Utilities.

1.3 REFERENCES

A. AASHTO T180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ANSI/ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ANSI/ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

D. ANSI/ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

E. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

F. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

G. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

1.4 DEFINITIONS

A. Utility: Any buried pipe, conduit, or cable.

1.5 FIELD MEASUREMENTS

A. Verify that survey bench mark and intended elevations for the Work are as shown on drawings.

1.6 COORDINATION

A. Coordinate work under provisions of Contract.

B. Verify works associated with lower elevation utilities are complete before placing higher elevation utilities.

C. Owner shall be given two (2) days prior notification by sub-contractors prior to commencing digging operations.

D. A Construction Safety Work Permit shall be obtained from a designated Owner employee prior to commencing excavation operations with motorized equipment.

E. Layout of excavation shall be performed by sub-contractor and verified by an Owner representative prior to beginning work. The purpose of this is to allow Owner to verify any utilities in the area. Contractors must verify all existing underground utilities by hand-digging test holes at all points of intersection.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Fill materials shall be as specified on plans and Section 322323.13 – Backfill.

PART 3 - PARTS – EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Protect plant life, lawns and other features remaining as a portion of final landscaping.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities which are to remain.

E. Cut out soft areas of subgrade not capable of in situ compaction. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

F. Escape ladders shall be provided in trenches in excess of four (4) feet deep.

G. All trenches in excess of five (5) feet in depth shall be shored or sloped.

H. Proper barricading road closings and night lighting shall be provided for all open trenches.

3.2 EXCAVATION

A. Excavate subsoil required for utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd. measured by volume.

F. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.3 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. All fill and backfill should be placed in maximum 8-inch thick, loose lifts and compacted to at least 95 percent of maximum dry density as determined by the ASTM D 1557 test procedure. Fill materials in landscaped areas should be compacted to 90 percent of maximum dry density. The moisture content of the fill should be maintained with plus/minus two percentage points of optimum moisture during compaction.

1. Fill materials should be wetted or dried as necessary to efficiency of the compaction equipment used by the contractor, the lift thickness should be reduced as necessary to achieve the required degree of compaction throughout the full thickness of each lift.

D. Remove surplus fill materials from site.

3.4 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 3/8 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Contract.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Contract.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 312316.23

SECTION 312323.13 – BACKFILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under paving.

D. Consolidation and compaction as scheduled.

1.2 RELATED DOCUMENTS

A. Section 311000 – Site Preparation.

B. Section 312000 – Earth Moving.

C. Section 312316.13 – Trenching.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ANSI/ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

C. ANSI/ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

E. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

F. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

G. NJDOT Standard Specifications for Road and Bridge Construction, 2007, and amendments.

H. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Fill: Conforming to NJDOT Section 901. Backfill shall consist of clean fill only. No debris shall be allowed as part of the backfill material.

B. Structural Fill: Conforming to NJDOT Section 901.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, damp proofing or waterproofing installation has been inspected.

3.2 PREPARATION

A. Prior to commencement of backfill operations, an authorized Owner representative must sign off on all underground work.

B. After the stripping operations and prior to placement of any new fill, the existing subgrade soils should be proofrolled to recompact any areas disturbed by the stripping operations and to detect any soft or otherwise unstable areas that must be removed and replaced with suitable fill material. A compactor with a minimum static weight of ten tons and with vibratory capability should be used for the proofrolling work. The proofrolling will be monitored by the Geotechnical Engineer who will determine the acceptability of the subgrades and also will determine whether vibratory or static proofrolling is appropriate.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. All fill and backfill used for support of footings, slabs, pavements, and sidewalks should be placed in maximum 12-inch thick, loose lifts and compacted to at least 95 percent of maximum dry density as determined by the ASTM D1557 test procedure. Fill materials in landscaped areas should be compacted to 90 percent of maximum dry density. The moisture content of the fill should be maintained with plus/minus two percentage points of optimum moisture during compaction. Fill materials should be wetted or dried as necessary to achieve the required moisture content. Depending on the efficiency of the compaction equipment used by the contractor, the lift thickness should be reduced as necessary to achieve the required degree of compaction throughout the full thickness of each lift.

D. All backfill shall be placed in lifts of 12" or less.

3.4 TOLERANCES

A. Top Surface of Backfilling under Paved Areas: Plus or minus 3/8 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Contract.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

C. All soils testing shall be performed by an independent agency, employed by and reporting directly to Owner.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Contract.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION 312323.13

SECTION 321216 – ASPHALT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Hot-Mix Asphalt Paving

   a. Roads
   b. Parking lots
   c. Driveways

2. Patch and Repair of Existing Pavement where shown on Contract Drawings.
3. Pavement markings, including temporary markings before sealer coat and final markings after sealer coat.

1.2 RELATED DOCUMENTS:

A. Related documents:

1. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 00 and 01 Specification Sections, govern the work of this Section.

B. NJDOT Standards.

C. Related Sections:

1. Section 312000 – Earth Moving
2. Section 321373 – Expansion Joints

1.3 SUBMITTALS

A. Product Data: For each product specified include technical data and tested physical performance properties.

B. Job Mix Designs: For each job mix proposed for the work.

C. Material Certificates: Provide copies of material certificates signed by material producer and Contractor certifying that each material item complies with, or exceeds, specified requirements, including job mix design.

1.4 QUALITY ASSURANCE

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the State of New Jersey Department of Transportation (NJDOT), or of authorities having jurisdiction.

B. Use locally available materials and gradations which meet standard state highway specifications and exhibit satisfactory records of previous installations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacturer, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50°F. and when temperature has not been below 35°F. for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40°F. and when base is dry. Base course may be placed when air temperature is above 30°F. and rising.

C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40°F for oil-based materials, 50°F for water-based materials, and not exceeding 95°F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with ASTM D692 and NJDOT Standard Specifications for Road and Bridge Construction latest edition.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D1073 and NJDOT Standard Specifications for Road and Bridge Construction latest edition.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D242, if recommended by applicable DOT standards.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: Comply with ASTM D3381; Table 2 AC-10, AC-20, or AC-30, NJDOT Standard Specifications for Road and Bridge Construction latest edition.

B. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either ASTM D2397 or ASTM D2399, MC-30 or SS-1 h and NJDOT Standard Specifications for Road and Bridge Construction latest edition.

C. Tack Coat: Emulsified asphalt; ASTM D2397 or ASTM D2399, SS-1 h, CSS-1, or CSS-1 h and NJDOT Standard Specifications for Road and Bridge Construction latest edition.

2.3 AUXILIARY MATERIALS

A. Water: Potable

B. Sand: ASTM D1073, Grade No's. 2 or 3.

C. Joint Fillers

1. Bituminous Fiber Joint Filler: Preformed strips of asphalt saturated fiberboard, complying with ASTM D1751.

D. Pavement-Marking Paint: See section 321723 – Pavement Markings

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; as shown on the approved plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Notify General Contractor in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt minerals, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.35 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Base Coat: Apply over compacted subgrade. Apply material to penetrate and seal, but not flood surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

E. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement.

F. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfacing. Remove and clean damaged surfaces.

3.3 HOT-MIX ASPHALT PLACING

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature as specified by NJDOT. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Placing Asphalt Paving: Place in strips not less than 10’ wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

D. Final course of asphalt paving shall be installed at completion of Project, at scheduled time as approved by Owner’s Representative.

3.4 ROLLING AND COMPACTION

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened, and in no case sooner than six hours.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 PAVEMENT MARKING

A. General: The extent of pavement marking is shown on the Drawings.

B. Allow paving to cure before starting markings.

C. Preparation: Sweep surface with power broom supplemented by hand brooms to eliminate loose material and dust.

D. Apply paint products in accordance with manufacturer's published instructions using application procedures approved for the particular application and substrate to the specified Minimum Dry Film Thickness (MDF). Apply each coat to uniform finish.

E. Apply paint markings on surfaces that are dry and rain is not expected within 24 hours.

F. Apply paint markings only when surface or air temperature is 50°F or above.

G. Apply 2 coats at 7 mils OFT each coat or the manufacturer recommended rate without addition of thinner, with maximum 100 square feet per gallon coverage. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to provide uniform, clean, and straight stripe.

H. Clean-Up: Upon completion of the work, Contractor shall perform clean-up as necessary, eliminating any incorrectly painted lines or spills by paint remover or painting over with blending color, and leaving the area in a neat and finished condition.

3.6 FIELD QUALITY CONTROL

A. General: Provide results of reports to test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner’s Representative.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding the following allowable variation from required thickness:

1. Base Coat: Plus or minus ¼”
2. Surface Course: Plus or minus ¼”

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness using 10' straightedge applied parallel with, and at right angles to, centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

1. Wearing Course Surface: 3/16"

D. Compaction: Field density test for in place materials shall be performed by examination of field cores in accordance with one of the following standards:

1. Bulk Specific Gravity of Paraffin-coated Specimens: ASTM D 1188, minimum one core per 20,000 square feet – minimum of 3 cores.
2. Bulk Specific Gravity Using Saturated Surface- Specimens: ASTM D 2726, minimum one core per 20,000 square feet – minimum of 3 cores.

E. Flood Test:

1. Schedule: After the pavement is complete, perform a flood test if required by the Owner's Representative.
2. Method: Perform the flooding by use of water tank truck or available water.
3. If depressions exist where water is ponding to a depth of more than 1/8 inch, fill with fresh hot asphalt concrete to provide proper drainage. Feather and smooth the edges of fill so that the joint to original surface is not visible.

F. Check surface areas at intervals as directed by Owner's Representative.

3.7 CLEAN-UP

A. Upon completion of the work, Contractor is to clean-up the site and leave it in a finished condition acceptable to the Owner.

END OF SECTION 321216

SECTION 321313 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:

1. Extent of Portland cement concrete paving is shown on Drawings, including curbs, walkways, approaches, pavement, and exterior stairs.
2. Pavement-Marking Paint
3. Paving Joint Sealers

1.2 RELATED DOCUMENTS:

A. Related documents:

1. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, govern the work of this Section.

B. Related Sections:

1. Section 31 20 00 – Earthwork
2. Section 03 30 00 – Site Cast-in-Place Concrete

1.3 SUBMITTALS

A. Provide samples, manufacturer's product data, laboratory test reports, and materials' certifications as required in referenced Sections for concrete and joint fillers and sealers.

B. Product Data: Proprietary materials, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials and others if requested by Architect.

C. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

B. Installer Qualifications: An experienced installed who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

D. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

E. Obtain Joint Sealant Materials from a single manufacturer for each different product specified.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Accessibility Requirements:

1. Concrete ramps and curbs shall be provided to conform with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and State and Local Regulations. These requirements supersede Technical Specifications in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Plywood, metal, metal-framed plywood, or other approved panel-type material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible spring steel forms or laminated boards to form radius bends for curves of a 100-foot or less radius and as required.

B. Form Release Agent: Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete. Provide commercial formulation with a maximum of 350 g/L volatile organic compounds (VOC's).

C. Plain-Steel Welded Wire Mesh: Fabricated from as-drawn steel wire into flat sheets, ASTM A-185.

D. Reinforcing Bars and Tie Bars: Deformed steel bars, ASTM A-615, Grade 60.

E. Plain, Cold-drawn Steel Wire: ASTM A 82.

F. Joint Dowel Bars: Plain steel bars, ASTM A-615, Grade 60. Cut bars true to length with ends square and free of burrs.

G. Epoxy-Coated Joint Dowel Bars: ASTM A 775 with ASTM A 615, Grade 60 Plain Steel Bars.

H. Hook Bolts: ASTM A-307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.

J. Concrete Materials: Comply with requirements of applicable Division 3 Sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

K. Expansion Joint Materials: Comply with requirements of applicable Division 7 Sections for preformed expansion joint fillers and sealers.

1. Bituminous Fiber Joint Filler: Pre-formed strips of asphalt saturated fiberboard, complying with ASTM D 1751.

L. Clear Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C-309, Type I, Class A unless other type acceptable to Architect. Moisture loss no more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

M. Bonding Compound

1. Epoxy Adhesive: ASTM C-881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

a. Manufacturers:

1) "Sikadur Hi-Mod", Sika Chemical Corporation
2) "Eucopoxy 452 or 620", Euclid Chemical Company

N. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N, or latex, water-base emulsion, ready mixed, complying with FS TT-P-1952 and NJDOT specifications for Road and Bridge Construction, latest edition.

1. Color:

a. White for parking stalls.
b. Blue for accessible spaces.
c. Yellow for fire lanes.

2.2 JOINT MATERIALS

A. Sealed expansion and contraction joints: Filler of nonbituminous rubber or cork conforming to ASTM D1752.

B. Non-sealed joints:

1. Manufacturers:

a. "Elastizell"; Elastizell Corp. of America (734-761-6900)
b. "Flexcell"; Celotex Corp. (813-873-4000)
c. "Seal Tight Fiber Expansion Joint"; W.R. Meadows Inc. (800-342-5976)

1) Filler premolded bituminous type conforming to ASTM D756;

C. Noncompressive Filler:

1. Manufacturers:

a. "Styrofoam SM"; Dow Chemical Co. (800-441-4369)

D. Compressive Filler:

1. Manufacturers:

a. "Ethafoam"; Dow Chemical Co. (800-441-4369)

1) 1" or 2" thick sheets, compression modulus within the range of 15 to 25 pounds per square inch per inch.

E. Filler Adhesive for Noncompressive Filler and Compressive Filler:

1. Manufacturers:

a. "General Purpose Mastic No. 11"; Dow Chemical Co. (800-441-4369)

2. Slab-on-grade Construction Joints: Provide a full slab depth 24 gauge metal preshaped key approximate depth of key to be 1/4 slab thickness and a key width of about 1/10 slab thickness.

F. Joint Sealants: ASTM C920. Non-priming, pourable, self-leveling polyurethane.

1. Manufacturers:

a. "SL2"; Sonneborn Building Products (800-496-6067)
b. "Sonomeric 1 Sealant"; Sonneborn Building Products (800-496-6067).
c. "Sonomeric 2 Sealant"; Sonneborn Building Products (800-496-6067).
d. "Vulkem 45"; Tremco, Inc. (800-562-2728)
e. "THC 900"; Tremco, Inc. (800-562-2728)

2.3 MIXES

A. Concrete Mixes: Comply with requirements of applicable Division 3 Sections for concrete mix design, sampling and testing, quality control, and as herein specified.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 4500 psi minimum at 28 days, unless otherwise indicated.
2. Slump Limits: 4 inches
3. Air Content: 6 percent

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and subgrade is ready to receive paving.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

C. Concrete shall not be placed on a soft, spongy, frozen, or otherwise unsuitable subgrade. The subgrade shall be moist when concrete is placed.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/4 inch in 10 feet.
2. Vertical face on longitudinal axis not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

D. Slope step treads at 1/4 inch per foot to drain.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement, with recommendations in CRSI's "Placing Reinforcing Bars" and as specified in Division 3 Sections, for placing and supporting reinforcement.

B. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2" overlap to adjust mats.

3.4 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Weakened-Plane (Contraction) Joints: Form weakened-plane (contraction) joints, sectioning concrete into areas as shown on Drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, with one of the following methods:

1. Sawed Joints; Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8" wide joints into hardened concrete as soon as surface will not be torn, abated, or otherwise damaged by cutting action.
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces. Provide 1/4" radius.

C. Construction Joints: Set construction joints at side and at end terminations of pavement and at locations where placement operations are stopped for more than 1/2 hour, unless pavement terminates at isolation joints.

1. Construct joints as shown or, if not shown, use standard galvanized steel or plastic keyway-section forms, or bulkhead forms with keys. Embed keys at least 1-1/2" into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.

D. Isolation Joints: Provide premolded joint filler for isolation joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20' for each pavement lane unless otherwise indicated.
2. Extend joint fillers full width and depth of joint. Terminate joint filler less than 1/2" or more than 1" below finished surface if joint sealant is indicated. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
3. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
4. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces. Provide 1/4" radius, unless noted otherwise.

3.5 CONCRETE PLACEMENT

A. General: Comply with requirements of Division 3 Sections for mixing and placing concrete, and as herein specified.

B. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

C. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

D. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

E. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

F. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

G. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint. Do not push or drag concrete into place or use vibrators to move concrete into place.

3.6 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating.

B. After floating, test surface for trueness. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4"
2. Thickness: Plus 3/8", minus 1/4"
3. Surface: Gap below 10' long, unleveled straightedge not to exceed 1/4"
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1"
5. Vertical Alignment of Tie Bars and Dowels: 1/4"
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2"
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4" per 12".
8. Joint Spacing: 3"
9. Contraction Joint Depth: Plus 1/4", no minus.
10. Joint Width: Plus 1/8", no minus.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2 inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

a. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

E. Exposed vertical surfaces shall be finished as follows:

1. Smooth form finish with grout-cleaned finish.
2. Refer to Section 03300 for finish description.

F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.7 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 Sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.8 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's rates to provide a minimum wet film thickness of 15 mils.

3.9 REPAIRS AND PROTECTIONS

A. Repair or replace broken, damaged, defective concrete, or does not meet requirements of this Section, as directed by Architect.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - EXPANSION JOINTS AND JOINT SEALANTS FOR PAVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joints between:

1. Concrete pavement.
2. Concrete and asphalt pavement.
3. Concrete unit pavers and curb.
4. Concrete unit pavers.

B. Related Sections include the following:

1. Section 033000 – Site Cast-in-Place Concrete
2. Section 321216 – Asphalt Paving
3. Section 321313 – Portland Cement Concrete Paving

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required. Install joint sealant samples in 1/2-inch- wide joints formed between two 6-inch- (l50-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Qualification Data: For firms and persons scheduled to perform the work of this section demonstrating their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.

E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results from a qualified testing agency, based on testing current sealant formulations within a 36-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

D. Pre-construction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type of material, including joint substrates, joint-sealant backer materials, secondary seals, and miscellaneous material.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint sealant manufacturers' written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if joint sealant manufacturer submits joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: Match samples as selected by Owner.

C. Colors of Exposed Joint Sealants: As indicated by referencing manufacturers' designations.

D. Colors of Exposed Joint Sealants: As selected by Owner from manufacturer's full range for this characteristic.

2.2 EXPANSION JOINTS

A. Expansion joint material shall be one of the following:

1. Pre-molded bituminous fiber joint filler requiring a bond breaker and sealant or approved equal.
2. Pre-molded closed cell expanded polyethylene foam joint filler, such as Sonoflex F by Sonneborn Corporation, Shakopee, MN requiring only sealant, or approved equal.
3. Shredded recycled rubber aggregate joint filler, such as a polymerically bound reclaimed rubber expansion joint CEJ6510 by Concrete Expansion Joint Company, requiring only sealant

B. Bond Breaker: If bituminous fiber material is used, a bond breaker such as one-half inch (1/2") wide polyethylene tape or five-eighths inch (5/8") diameter expanded polyethylene foam backer rod shall be installed as recommended by the manufacturer. A bond breaker will not be required for a pre-molded foam joint or a shredded recycled rubber aggregate joint filler, however sealant shall be required.

C. Joint-Sealant Backer Materials:

1. General: Provide joint-sealant backer materials that are non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
2. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
3. Backer Strips for Cold-and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
4. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

D. Joint Sealant: Prepared expansion joints shall be coated with a primer followed by installation of a bond breaker and a self-leveling two-component polyurethane-based elastometric sealant. Contractor shall apply Sikaflex 429 primer with Sikaflex - 2C SL sealant, manufactured by Sika Corp., Lyndhurst, NJ; or Sonneborn 733 primer with Sonolastic SL-2 sealant, by Sonneborn and ChemRex, Inc., Shakopee, MN, or approved equal. Color of sealant shall match adjacent pavement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on pre-construction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturers' written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF EXPANSION JOINT AND SEALANTS

A. Place expansion joints as shown. Install bond breaker if necessary, as shown, and fill space as indicated on the plans with a joint sealant.

B. Thoroughly clean expansion joints of dirt, loose particles, asphalt, tar, paint, wax, waterproofing, and curing compounds.

C. When dry, apply primer to the clean dry surfaces by brushing on a thin, uniform coat. Allow primer to dry, tack free.

D. Fill joint with filler where necessary and compressible backer rod and leave a one-half inch (1/2") deep void for placement of sealant. Cover adjacent sides of joints with masking tape to prevent spillage onto pavement.

E. Fully mix the two component sealant and pour into joint slot in one direction and allow to flow and level out as necessary. Smaller joints can be filled from a bulk-loading gun.

F. Fill joints from bottom to prevent air voids. Tool lightly to smooth out ripples and maximize adhesion to the sides of joints. If bubbles form, wait 5-10 minutes before tooling to break the bubbles. Remove excess sealant promptly as the work progresses and clean adjacent surfaces. Remove masking tape.

G. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.4 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 331000 - SITE WATER LINES

PART 1 – GENERAL

1.1 DESCRIPTION

A. General: Provide all labor, equipment and materials required to complete and shall complete the construction of site water lines including but not limited to the following general items of work in accordance with the Drawings and Specifications:

1. Providing water main piping and fittings, valves, valve boxes, thrust blocks, and related materials and labor adjunct to the completion of the site water main.
2. Provide fire hydrants, fire department connections, post indicator valves, and related materials and labor adjunct to the completion of the exterior fire protection system.

1.2 RELATED DOCUMENTS

A. Drawing and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, govern the work of this section.

B. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

C. Approved NJ American Water Service Connection and City of Elizabeth Road Opening permits.

D. AWWA Standards.

E. NJ American Water Company Standards.

F. Related work specified elsewhere:

1. Section 31 10 00 – Site Preparation
2. Section 31 20 00 – Earth Moving
3. Section 03 30 00 – Site Cast-In-Place Concrete

1.3 DEFINITIONS

A. DIP: Ductile Iron Pipe

1.4 SUBMITTALS

A. Shop Drawings: The Contractor shall submit detailed Shop Drawings for all water line work.

B. Record Drawings: The Contractor shall submit, prior to final payment, accurate record drawings for all water line and associated work.

C. Test Reports.

D. Disinfection Report

1. Type and form of disinfectant used.

a. Date and time of disinfectant injection start and time of completion.
b. Test locations.

c. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
d. Date and time of flushing start and completion.
e. Disinfectant residual after flushing in ppm for each outlet tested.

2. Bacteriological report; record:

a. Date issued, project name, and testing laboratory name, address, and telephone number.
b. Time and date of water sample collection.
c. Name of person collecting samples.
d. Test locations.

e. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
f. Coliform bacteria test results for each outlet tested.
g. Certification that water conforms, or fails to conform, to bacterial standard of New Jersey Department of Environmental Protection and County Health Department.
h. Bacteriologist's signature and authority.

3. Certificate: Certify that cleanliness of water distribution system meets or exceed specified requirements.

1.5 REGULATORY REQUIREMENTS

A. Specification references made herein for manufactured materials such as pipe, hydrants, valves and fittings refer to designations for American Water Works Association (AWWA), or to American Standards Association (ASA) as they are effective on the date of call for bids.

B. Copies of these publications may be obtained at nominal cost from the American Water Works Association, 2 Park Avenue, New York, NY 10016, and from the American Standards Association, 10 East 40th Street, New York, NY 10016

C. All work shall conform to NJ American Water Company standards which shall take precedence to the above-named standards and these Specifications in the event of a conflict, however, if the requirements of these Specifications are more stringent.

1.6 QUALITY ASSURANCE

A. Reference Standards:

1. Some products and execution and specified in this Section by reference to published specifications or standards of the following (with respective abbreviation used):

a. The American Society for Testing and Materials (ASTM)
b. American Water Work Association (AWWA)
c. American Standards Association (ASA)

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner's Representative not less than one week in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's Representatives written permission.

PART 2 – PRODUCTS

2.1 DUCTILE IRON PIPE

A. Water mains shall be ductile iron with cement mortar lining complying with ANSI/AWWA C104/A21.4. Pipe and fittings shall be ductile iron mechanical jointaccording to ANSI/AWWA C111/A21.11. Pipe and fittings shall be Class 53. Provide 8 mil polyethylene tube encasement around pipe per ANSI/AWWA-C105/A21.5. Ductile Iron Pipe: AWWA C151: with cement mortar lining complying with AWWA C104, Class 53, or as required by NJ American Water Company or the City of Elizabeth.

1. Fittings: Ductile iron, standard thickness.
2. Joints: ANSI/AWWA C111, rubber gasket with rods.

B. All service pipes, sizes 2-inches through 12-inches, shall be Pressure Class 350 psi, cement-lined ductile iron pipe with mechanical joints complying with ANSI/AWWA C104/A21.4 and ANSI/AWWA C111/A21.11, or as required by NJ American Water Company or the City of Elizabeth.

C. Copper Tubing: ASTM B88, Type K annealed:

1. Fittings: ANSI/ASME B16.18, cast copper, or ANSI/ASME B16.22, wrought copper.
2. Joints: Compression connection or ANSI/AWS A5.8, BCuP silver braze.

2.2 VALVES

A. The valves shall be gate valves suitable for ordinary waterworks service, intended to be installed in a normal position on buried pipe lines for water distribution.

B. The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of the latest AWWA C500. All materials used in the manufacture of waterworks gate valves shall conform to AWWA standards designed for each material listed.

C. The gate valve shall be NJ American Water Company standard valves M&H Metropolitan mechanical joint valves as manufactured by Dresser Company or approved equal. Valves shall be non-rising stem, mechancial joint. Gate valves shall be standard pattern and shall have the name or mark of the manufacturer, size and working pressure plainly cast in raised letters on the valve body.

D. The valve bodies shall be cast iron, mounted with approved non-corrosive metals. All wearing surfaces shall be bronze or other approved non-corrosive material and there shall be no moving bearing or contact surfaces of iron in contact with iron. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

E. All gate valves shall be two-faced, non-rising stem, double disc, with parallel seats of bronze or other approved wedging devices placed between them. The stem shall be of high tensile strength bronze or

other approved non-corrosive metal. All nonferrous bushings shall be of substantial thickness tightly fitted and pressed into machined seats. All valves shall open by turning to the right, unless otherwise specified.

F. End connections for gate valves shall be pushed-on (rubber gasketed) joints.

G. All gate valves up to and including 12 inches in size shall be furnished with O-ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals.

H. Wrench nuts shall be made of cast iron and shall be 1-15/16 inches square at the top, two inches (2") square at the base, and 1-1/4 inches high, unless otherwise designated in the special provisions. Nuts shall have a flanged base upon which shall be cast an arrow at least 2 inches long showing the direction of opening. The word "Open" in 1/2 inch or larger letters shall be cast on the nut to clearly indicate the direction of opening the valve.

I. Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subject to the following hydrostatic pressure tests: Each 3 inch to 12 inch valve, inclusive, shall be subjected to hydrostatic pressure test under pressures of both 300 psi and 175 psi. These tests shall be conducted in accordance with provisions of AWWA C500.

J. After the factory test and inspection, all ferrous parts of the valves except finished or bearing surfaces shall be painted inside and out with two coats of asphalt varnish.

2.3 TAPPING SLEEVE AND VALVE

A. Complete assembly, including tapping sleeve, tapping valve and bolts and nuts. Use sleeve and valve compatible with tapping machine.

1. Tapping Sleeve: Solid ductile iron mechanical joint tapping sleeve such as Mueller H-615 tapping sleeve or approved equal shall be utilized for all taps 2-inches and larger. Use sleeve that mates with size and type pipe material being tapped. Outlet flange shall be size required for branch connection.
2. Tapping Valve: NJ American Water Company standard valves, M&H Metropolitan mechanical joint as manufactured by Dresser Company or approved equal. Tapping valves shall be non-rising stem, mechanical joint, furnished with a 2” square operating nut and shall be furnished opened right.

2.4 HYDRANTS

A. All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

B. The hydrant shall be two (2) piece “City of Elizabeth Standards” hydrants as manufactured by A.P. Smith or approved equal by City of Elizabeth. The name or mark of the manufacturer, size of the valve opening shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant has been installed.

C. As a minimum requirement, all hydrants shall be designed for a working pressure of 200 lbs. per square inch and in workmanship, design and material shall conform to the AWWA Standard A502. The hydrant bodies shall be cast iron, fully mounted with approved non-corrodible metals. All wearing surfaces shall be either bronze or some other approved non-corrodible material, and there shall be no moving bearing or contact surfaces of iron in contact with iron or steel. All contact surfaces shall be finished or machined in the best workmanlike manner and all wearing surfaces shall be easily renewable.

D. The design of the hydrant shall be such that all working parts may be removed through the top of the hydrant and shall have the required AWWA specified number of turns of the stem to open the gate an area equal to the area of the valve opening. Any change in area of the water passage through the valve must have an easy curve, and all outlets must have round corners of good radium.

E. Lugs, if required for harnessing the hydrant to the connecting pipe from the main in the street, shall be provided on the bell of the elbow or on the hydrant bottom casting. A drawing of the lug construction shall be submitted for approval, on request of the Construction Manager and the Owner.

F. Hydrants shall be provided with a sidewalk flange. Breaking devices shall be at the sidewalk flange which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point a safety stem coupling on the operating stem that will shear at the time of impact. Unless otherwise specified, all hydrants will be equipped with O-Ring stem seals

G. All dimensions, thread details and other specifications and construction details for all hydrants shall be approved by the Construction Manager.

H. Before the hydrant is painted at the factory, it shall be subjected to an internal hydrostatic test of 300 pounds per square inch with the hydrant valve in a closed position and again with the hydrant valve in an open position.

I. All iron parts of the hydrant both inside and outside shall be thoroughly cleaned and painted. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish. They shall be covered with two coats, the first having dried thoroughly before the second is applied. The outside of the hydrant above the finished ground line shall be thoroughly cleaned and thereafter painted with one coat of paint of a durable composition, and one additional coat of a color specified by the Construction Manager.

2.5 THRUST BLOCKS

A. Concrete for thrust blocks shall have minimum 28 day strenght of 3,000 psi and conform to Section 03 30 00 – Site Cast-In-Place Concrete and as indicated on Drawings.

2.6 TIE RODS

A. Tie rods shall be three quarter (3/4) inch diameter threaded steel bars. Rods shall have a minimum yield stress of 36,000 psi.

2.7 RING AND COVER AND VALVE BOX CASTING

A. Valve Boxes shall be NJ American Water Company standard as manufactured by Bingham and Tayor, or approved equal. Boxes shall have a minimum of 8-1/4 inch diameter and shall be an adjustable screw type with the box extending from the surface to 3-inches above the valve bonnet base. Valve box shall be cast iron with a standard coal tar foundry dip with cast iron drop cover and the word “WATER” cast in cover.

2.8 BEDDING MATERIALS

A. Bedding Fill as specified in Section 312323 and as indicated on Drawings.

2.9 BACKFILL MATERIALS

A. Backfill materials as specified in Section 312323 and as indicated on Drawings.

2.10 GEOTEXTILES

A. Geotextile Fabric: woven or non-woven fabric composed of polypropylene, polyvinyl chloride, nylon, polyolefins, polyamides, or polyester fibers and formed into a stable network such that the filaments or yarns retain dimesnion stability relative to each other. The geotexitle shall be inert to biological degradation and resist naturally encountered chemicals, alkilis, and acids. Geotextile shall be Mirafi 180N or approved equal or as directed by the Geotechnical Engineer or City of Elizabeth.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions under provisions of Contract.

B. Verify that building service connection and water main size, location and invert are as indicated.

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly

C. Prepare pipe connections to equipment with flanges or unions.

D. Notify NJ American Water Company prior to initiating installation of water main.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312316 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level fill materials as shown on Drawings.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

D. Broken stone foundation cushion shall be placed where subgrade soil conditions have been deemed inferior by the Geotechnical Engineer or as directed by NJ American Water Company or City of Elizabeth..

E. Geotexitle shall be placed in those areas where directed by the Geotechncial Engineer, NJ American Water Company or City of Elizabeth.

3.4 INSTALLATION OF PIPE

A. Maintain separation of water main from other utility piping in accordance with applicable codes.

B. Proximity to Sewers:

1. Water mains shall be laid at least 10 feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge to edge.

C. Water mains passing under sewers shall, in addition, be protected by providing:

1. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
2. Adequate pipe bedding of the sewers to prevent excessive deflection of joints and settling on and breaking the water mains.
3. That the length of water pipe be centered at the point of crossing so that the joints will be equi-distant and as far as possible from the sewer.

D. All pipe shall be laid to a minimum depth of 48 inches measured from the existing ground surface or established grade to the top of the barrel of the pipe. In areas subject to subsequent excavation or fill, the mains shall be laid to grades required on the Drawings.

E. The trench, unless specified otherwise, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid on approved granular material true and even so that the barrel of the pipe will have a bearing for its full length. Bell holes shall be excavated for joints. Any part of the trench excavation below grade shall be corrected with approved material and thoroughly compacted.

F. Where water is encountered in the trench, it shall be removed during pipe laying and jointing operations. Provisions shall be made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

G. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Construction Manager to ensure absolute cleanliness inside the pipe.

3.5 INSTALLATION OF VALVES

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.6 JOINTING OF PIPE

A. The inside of the bell shall be thoroughly cleaned to remove all foreign material from the joints. The circular rubber gasket shall be inserted in the gasket seat provided.

B. A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the Construction Manager.

C. The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the bell, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end into the seat of the bell. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint. Serrated brass wedges shall be provided for electrical thawing; two per joint, for 3 inch through 12 inches pipe; four for larger diameter pipe. Each wedge is driven into the opening between the plain end and the bell until snug. When four wedges are used, they are inserted side by side, in pairs.

D. Field-cut pipe lengths shall be beveled to avoid damage to the gasket and facilitate making the joint.

3.7 THRUST BLOCKING

A. Blocking to prevent movement of lines under pressure shall be placed at all bends, tees, caps, valves and hydrants. They shall be constructed as indicated on the Drawings and placed between solid ground and the fittings, and shall be anchored in such a manner that pipe and fitting joints will be accessible for repairs.

B. All bends of 11-1/4 degrees or greater, and all tees and plugs shall be thrust protected to prevent movement of the lines under pressure.

C. Contractor shall submit thrust block details to the Construction Manager for approval prior to the work. Details shall fully describe the width, length and depth of the thrust block, anchors where applicable, and the minimum concrete compressive strength.

3.8 TIE-RODS

A. Tie rods shall be installed at all bends and fittings.

3.9 PRESSURE TESTING OF WATER MAINS

A. Notify NJ American water Company and City of Elizabeth Water Department of testing of all water mains at least 48 hours prior to testing, unless otherwise directed by NJ American Water Company and / or City of Elizabeth. After the pipe has been laid and partly backfilled as specified herein, all-newly laid pipe or any valved sections of it shall, unless otherwise expressly specified, be subjected to a hydrostatic pressure equal to 50 percent more than the operating pressure at the lowest elevation of the pipe section, but not to exceed the pressure at the lowest elevation of the pipe section, but not to exceed the pressure rating of the type of pipe specified. The duration of each pressure test shall be for a period of not less than one hour and not more than six hours. The basic provisions of AWWA C600 and C603 shall be applicable.

B. Each interval of pipe to be tested, as determined by the Owner's Representative, shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump pipe connection and all necessary apparatus including gauges and meters shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation and afterwards tightly plugged. Any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to the Owner's Representative. Provisions of AWWA C600 and C603, where applicable, shall apply.

C. Leakage Test:

1. After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Test pressure is defined as the maximum operating pressure of the section under test and is based on the elevation of the lowest point in the line or section under test corrected to the elevation of the test gauge. Applicable provisions of AWWA C600 and C603 shall apply. Duration of each leakage test shall be a minimum of one hour in addition to the pressure test period.
2. Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{ND\,(P)^{1/2}}{7400}$$

NOTE: L = Allowable leakage in gallons per hours.
N = Number of joints in length of pipe line tested.
D = Nominal diameter of the pipe in inches.
P = Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly-laid pipe or any valved section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

3.10 DISINFECTION OF WATER MAINS

A. Flushing:

1. Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided large enough to develop velocity of at least 2-5/10 feet per second in the main. One 2-1/2 inch hydrant opening will, under normal pressure, provide this velocity in pipe sizes up to and including 12 inches.
2. All taps 2 inch size and smaller required for chlorination or flushing purposes, or for temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains. Taps larger than 2 inches shall be paid for as a bid item or as an extra.

B. Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that a chlorine residual of not less than 25 mg/1 remains in the water after standing 24 hours in the pipe. Chlorine shall be applied by one of the methods which follow subject to approval by the Owner's Representative.

1. A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or a dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solution of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.
2. A mixture of water and high-test calcium hypochlorite (65-70 percent C1) may be substituted for the chlorine gas water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 percent chlorine solution by adding water to give a total quantity of 7.5 gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while filling the main with water in the amounts as shown in the table which follows:

Chlorine Requirements to Produce 50 MG/L
Concentration in 100 Foot of Pipe - By Diameter

Pipe Size Inches	100% Chlorine Lb.	1% Chlorine Solution, Gals.
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

3. Tablet disinfection is best suited to short extensions (up to 2,500 feet) and smaller diameter mains (up to 12 inches). Since preliminary flushing must be eliminated in using this method, it should be utilized only when scrupulous cleanliness has been used in construction. It shall not be used if trench water or foreign material has entered the main or if the water is below 40 degrees F.
4. Tablets should be placed in each section of pipe, hydrant branches and other appurtenances. Tablets must be at the top of the main and shall be attached by an adhesive, such as Permatex No. 1 or any alternative approved by the Construction Manager. Tablets in joints between pipe sections, hydrants, hydrant branches or appurtenances are to be crushed and placed inside the annular space, rubbed like chalk in butt ends of sections to coat them if the type of assembly does not permit crushing.In filling a section if piping with water when using the tablet method, water velocity shall be less than 1 foot per second.

Number of 5-Gram Hypochlorite Tablets Required
for a Dosage of 50 MG/L per Length of Pipe Section

Pipe	Lenth of Pipe Section				
Inches	Up to 13	18	20	30	40
2	1	1	1	1	1
4	1	1	1	2	2
6	2	2	2	3	4
8	2	3	3	5	6
10	3	5	5	7	9
12	5	6	7	10	14

C. The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved or directed by the Construction Manager.

D. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

E. Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/1.

F. In the process of chlorinating newly-laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

G. Final Flushing:

1. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows upon test, a chlorine residual of less than 1 mg/1. In the event chlorine is normally used in the source of supply, then the tests shall show a residual of not in excess of that carried in the system.
2. After flushing, water samples collected on two successive days from the treated piping system, as directed by the Construction Manager, shall show satisfactory bacteriological results. Bacteriological analysis must be performed by a laboratory approved by the Environmental Protection Agency.

H. Repetition of Flushing and Testing:

1. Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.

3.11 INSTALLATION OF HYDRANTS

A. Hydrants shall be installed at or relocated to the locations as shown on the Drawings. They shall be plumb and shall be set so that the lowest hose connection is at least 24 inches above the surrounding finished grade.

B. All hydrants shall be inspected in the field upon delivery to the job site to insure proper operation before installation.

C. A minimum of 1/4 cubic yard of coarse stone shall be placed at and around the base of the hydrant to insure proper drainage of the hydrant after use.

D. The blocking of the hydrant shall consist of wedge of Portland cement concrete of not less than 1/4 cubic yard extending from the hydrant to undisturbed soil and shall be so placed to form a solid barrier adjacent to the hydrant base to counteract the pressure of water exerted thereon. Care shall be taken to insure that weep holes are not covered by concrete. The hydrant shall be set on a concrete block to insure a firm bearing on the hydrant base.

3.12 TAPPING VALVE INSTALLATION

A. The Contractor shall provide the excavation for the tapping valve installation.

B. The fully gasketed tapping valve shall be provided and installed by the Contractor.

C. The Contractor shall backfill and re-pave the street portion of the excavation as directed by the appropriate authority.

3.13 POST HYDRANT INSTALLATION

A. Install post hydrants in pavement or with concrete anchor.

3.14 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches to 8 inches below finished grade, directly over piping.

B. Attach nonmetallic piping label permantently to main electrical panel.

3.15 BACKFILLING

A. Backfill trench with select granular fill backfill material as specified in Section 312323. Place material in maximum 12” lifts and compact to 95% Modified Proctor Density or as directed by the Geotechnical Engineer, NJ American Water Company or City of Elizabeth.

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hole at test pressure for 1 hour, decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

3.17 CLEAN-UP

A. Upon completion of the Work, all surplus materials, debris, tools, and equipment shall be removed from the site.

END OF SECTION 331000

SECTION 333000 - SITE SANITARY SEWERAGE SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. General: Furnish all equipment, materials, labor and services required to complete and shall complete all site sanitary sewer work, shown on the drawings including but not limited to the following general items of work in accordance with the Drawings and Specifications:

1. Sanitary sewer, piping and fittings
2. Manholes, clean-outs and structures.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including Genearl and Supplementary Conditions, and other Division 1 Specification Sections, govern the work of this section.

B. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

C. New Jersey Department of Environamental Protection regulations.

D. National Standard Plumbing Code, latest edition.

E. City of Elizabeth Standard Requirements for New Sewer and Service Laterals.

F. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2007, or latest edition.

G. Related work specified elsewhere:

1. Section 31 10 00 – Site Preparation
2. Section 31 20 00 – Earth Moving
3. Section 03 30 00 – Site Cast-In-Place Concrete

1.3 DEFINITIONS

A. PVC: Polyvinyl Chloride.

B. DIP: Ductile Iron Pipe

1.4 SUBMITTALS

A. Shop Drawings: The Contractor shall submit detailed Shop Drawings for all sanitary sewerage system work.

B. Record Drawings: The Contractor shall submit, prior to final payment, accurate record drawings for all sanitary and associated work.

C. Test results and inspection reports.

1.5 REGULATORY REQUIREMENTS

A. All work shall conform to the New Jersey Environmental Protection standards which shall take precedence to these specifications. In the event of a conflict; however, if the requirements of these Specifications are more stringent, they shall apply.

1.6 QUALITY ASSURANCE

A. Reference Standards:

1. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviation used):

a. The American Society for Testing and Materials (ASTM).

B. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage systems.

C. City of Elizabeth Compliance: Comply with regulations pertainng to sanitary sewer system, including required testing.

D. Provide proper fittings for the installation of, and connection to, sewer lines. Where an underground branch connection is required, provide a "Y" branch and 30 degree curve type fitting. Connections made by cutting holes in pipe will not be permitted.

1.7 SUBMITTALS

A. Product data and shop drawings.

B. Test results.

C. As-built plans.

1.8 PROJECT CONDITIONS

A. Existing Sewers

1. When existing sewers are encountered, whether indicated on the Drawings or not, adequate provisions shall be made for diverting the flow of such existing sewers so that the excavation will be kept dry during the progress of construction. Reroute such existing sewers as required to maintain proper functioning. Before completion of the construction work, the existing sewers shall be restored as called for on the Drawings, or otherwise provided with an adequate outlet, as directed by the Construction Manager. Under no conditions shall underground lines be abandoned or plugged until sufficient tests have been made to indicate that it is not a functioning line, and then only when so directed by the Architect/Engineer in writing.
2. Reconnect existing drain lines which are to remain in service and which would otherwise be cut off and blocked by new Work.

B. Relationship to Water Lines

1. Sewer lines which cross over or under water lines and do not have an 18-inch vertical separation between pipes must be water grade ductile iron (DIP) with mechanical joints. Pipe to comply with ANSI/AWWA C104/A21.4, joints to comply with ANSI/AWWA

C111/A21.11. Pipe and fittings to be Class 53. This material is to extend 10'-0" on each side of the water line.

2. Where it is necessary to lay sewer pipes adjacent to existing water lines, where the flow line of the sewer pipe is above or level with the water lines, and the distance between them is less than 10 feet, then the sewer line shall be constructed of extra heavy cast iron, water sealed and tested, and the water line shall be relocated, as directed by the Architect/Engineer.

PART 2 – PRODUCTS

2.1 PIPE MATERIALS

A. PVC Sewer Pipe:

1. Sanitary sewer pipe shall be polyvinyl chloride (PVC) pipe of the integral wall bell and spigot type with elastomeric seal joints and smooth inner walls meeting or exceeding all of the requirements set forth in ASTM D-3034, SDR-35 for installation depths up to 14 feet and SDR-21 for installations greater than 14 feet.
2. The pipe shall have minimum cell classification of 12454-B or 12454-C and a minimum tensile strength of 34.50 MPa as defined in ASTM D-1784.
3. PVC sanitary sewer pipe shall have a minimum pipe stiffness of 46 psi for each diameter when measured at 5 degree vertical ring deflection and tested in accordance with ASTM D-2412.
4. The minimum wall thickness shall conform to SDR-35 and SDR-26 Type PSM as specified in ASTM D-3034. The date of manufacture, class of pipe, specification designation, size of pipe, name or trademark of manufacturer, and identification of plan/location shall be legibly marked on the outside of each sanitary pipe section in accordance with the ASTM D-3034.
5. Sanitary sewer pipe joints shall be flexible gasketed joints of the compression type so that when assembled the gasket inside the bell will be compressed radially on the pipe spigot to form a watertight seal. The gaskets sealing the joint shall be made of rubber of special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years' experience in the manufacturer of rubber gaskets for pipe joints. The gasket shall be a continuous ring of flexible joint rubber of a composition and texture which is resistant to common ingredients of sewage, industrial wastes and groundwater, and which will endure permanently under the conditions likely to be imposed by this service. The gasket shall conform to the requirements of ASTM F-477.
6. Sanitary sewer pipe fittings shall be manufactured fittings made of PVC plastic having a cell classification of 12454-B or 12454-C as defined in ASTM D-1784.

B . Where indicated on the drawings piping shall be Ductile Iron (DIP) with cement mortar lining complying with ANSI/AWWA C104/A21.4. Pipe and fittings shall be ductile iron mechanical joint or push-on type according to ANSI/AWWA C111/A21.11. Pipe and fittings shall be Class 53. Provide 8 mil polyethylene tube encasement around pipe per ANSI/AWWA-C105/A21.5.

2.2 MANHOLES

A. Unless otherwise approved by the Architect/Engineer or called for on the Drawings, manholes shall be precast concrete made up of vertical sections of appropriate length and diameter to meet drawing requirements. The precast sections shall be reinforced with steel, in accordance with ASTM C478 standards, with tongue and groove joints.

B. The top section shall be flat or tapered to the size required to make a proper base for the cover and frame called for (see plan for type required). The bottom section shall have openings cast therein to receive sewer lines which are to be connected thereto. In the event that a sewer line empties into the

manhole at an elevation above the first section, it shall have an opening cast therein to receive such lines.

C. Joints: Continuous rubber gasket, meeting standards of ASTM C443.

D. Resilient Pipe Connectors: ASTM C 923 cast or fitted into manhole walls, for each pipe connection.

E. Steps: Aluminum ladder rungs ALCO NO. 14869 or PVC rungs (ASTM C478), wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48-inches.

F. Grade Rings: Reinforced-concrete rings, to match diameter of manhole frame and cover.

G. Protective Coatings: Exterior of concrete manholes/structures shall receive a seal coat of Carboline 50 or approved equal, 18 mil. thick.

H. A drop manhole connection shall be used where there is a difference in elevation of two (2) feet or greater between the invert of a sanitary or combined inlet pipe to manhole and the crown of the outlet pipe from manhole. Drop connection shall be constructed as shown on Drawings.

2.3 FRAMES AND COVERS

A. Manhole frames, covers, steps, materials, and equipment in this classification shall be of the type and duty shown on the Drawings and in accordance with City of Elizabeth requirements. Iron castings shall conform to ASTM A48 and shall be designed for heavy-duty traffic.

B. Physical Requirements: Castings shall be true-to-pattern in form and dimension, free from faults, sponginess, cracks, blowholes, and other defects affecting their strength.

C. New Manhole construction shall be provided with concentric frame and cover, Campbell Foundry Pattern No.4428, or approved equal.

D. The letters “City of Elizabeth” and “SEWER” shall be cast on the cover as indicated on the Drawings.

2.4 BEDDING AND BACKFILL MATERIALS

A. Bedding and backfill materials shall comply with NJDOT Standard Specifications for Road and Bridge Construction, Section 652 and Design and Construction of Urban Stormwater Management Systems: ASCE Manuals and Reports of Engineering Practice No.77 or as directed by the Geotechnical Engineer or City of Elizabeth.

2.5 MANHOLE BASE MATERIAL

A. 1½” crushed stone, No. 4 stone per NJDOT Standard Specifications for Road and Bridge Construction, Section 901.03, or as directed by the Geotechnical Engineer or City of Elizabeth.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPES

A. Pipe trenches shall be excavated to the lines and grades shown on the Drawings. Depth of trench shall be as required to provide for the specified bedding materials.

B. All excavations shall be adequately sloped or shored and braced to protect the property of the Owner and neighboring Owner(s), and the safety of the workmen. All such protection shall be in accordance with the Occupational Safety and Health Act (OSHA) requirements and all other applicable codes and ordinances, including the Health and Safety Work Plan.

C. Trench width, measured at the top/centerline of the pipe, shall be a minimum of two (2) feet plus the outside diameter of the pipe.

D. Sanitary sewer pipe bedding and backfilling shall be as shown on the Drawings.

E. Sanitary sewer pipe joints shall be assembled in accordance with the pipe manufacturer's recommendation and ASTM D-3212.

F. All field cutting of sanitary sewer pipe shall be done in a neat, trim manner using a hand or power saw, and the cut end shall be beveled using a file or wheel to produce a smooth bevel of approximately 15 degrees and be a minimum depth of one-third the pipe wall thickness. Field cut pipe will only be allowed to be installed at manholes, at prefabricated tees and wyes, and at the connection of new sanitary sewer to existing sanitary sewer.

G. All pipe trenches shall be backfilled, after inspection by the Construction Manager and Testing Agency Representative, with mechanically compacted backfill material as specified in Section 2.4 of these Specifications, or as directed by the Geotechnical Engineer or City of Elizabeth.

H. All sewer service connection 6-inches in size or smaller must be made directly to the sewer main and all connections 8-inches in size or larger must be made to a manhole. Where a connection to a manhole is required, manhole bench and channel may require modification.

I. Sewer service lateral connections to City of Elizabeth’s sewer main shall be made above horizontal center line of pipe and as shown on Drawings.

J. Circular hole saws which are approximately sized or hand drills must be used to make the openings in the existing sewer to receive the laterals. Jackhammers, sledgehammers and other unsuitable tools or machinery which may damage the City of Elizabeth’s sewer main are not allowed to be used to make the lateral openings. All debris must be removed and not allowed to fall into pipe.

K. All existing sewer mains and sanitary laterals to be abandoned must be filled with concrete slurry or removed from the ground. Catch basins and manholes must be removed from the ground. Connections must be cut and sealed at the main and precautions must be undertaken by the contractor to ensure concrete and other materials do not enter the main and create obstructions.

L. The Contractor shall be responsible for protecting all drainage structures and conduits from damage due to construction equipment.

3.2 SEWER TESTS AND REPAIRS

A. All sewers shall comply with City of Elizabeth testing/inspecting procedures.

B. Scheduling: A schedule shall be submitted by the Contractor sufficiently in advance of testing to enable the Owner’s representative to assign inspection to the testing operations.

C. Testing of Completed Sewer System

All sewers constructed within City of Elizabeth by Contractors not contracted to the City of Elizabeth shall comply with the following testing/inspection procedures.

1. CCTV inspection of all pipes, including, but not limited to vitrified clay pipe (VCP), reinforced concrete pipe (RCP), polyvinyl chloride pipe (PVC), ductile iron pipe (DIP), high-density polyethylene pipe (HDPE) with a copy of the video showing distances, date, operators, names, and a letter signed and sealed by the NJPE certifying tape (where applicable when City of Elizabeth has not received an inspection fee to conduct a CCTV inspection).
2. The testing shall be witnessed by a representative of the City of Elizabeth. In the event that the developer/Contractor is testing without the City of Elizabeth representative present and has written permission from the City of Elizabeth Chief Engineer. All test data and results shall be signed and sealed by a New Jersey Licensed Professional Engineer from a certified independent testing company.
3. Air pressure testing for the following pipe types: PVC, DIP, VCP, HDPE, and RCP adhering to the procedure as follows (ASTM F1417-92) or (ASTM 924 for RCP):

    a. All laterals shall be installed.
    b. Trench is backfilled.
    c. Pipe is cleaned and has been flushed.
    d. Stabilized base asphalt pavement is in place.
    e. Pipes entering manholes are plugged at the inside face of manhole laterals, are plugged at ends and clean outs (where applicable) are plugged at top.
    f. Pipe is pressurized to 3.5 psig with an allowable maximum pressure drop of 0.5 psig over the time period as shown in the table below.

Pipe Size	Time
8”	3 min. 47 sec.
12”	5 min. 40 sec.
15”	7 min. 5 sec.
18”	8 min. 30 sec.
24”	10 min. 0 sec.

    For pipes with 24-inch diameter, or where laterals are included in main being testing, see the test time calculation procedure in section six (6).

    In cases where a connection to a manhole is a drop configuration, plugs shall be placed in both upper and lower pipes of the drop, and the assembly shall be tested as a part of the pipeline.

4. Testing of Reinforced Concrete Pipe and Vitrified Clay Pipe:

    a. Pipe shall be backfilled; stabilized base asphalt pavement shall be in place.
    b. All laterals and clean outs installed and plugged at ends.
    c. Both ends of pipe shall be plugged.
    d. The pipe shall be filled with water to a level of 24-inches above crown of pipe or 12-inches above groundwater whichever provides greater head pressure. Filling with water and bleeding of air shall be at the upstream end of the pipe.
    e. The test shall be held for 24 hours with an allowable leakage rate of one hundred (100) gallons per inch diameter per mile, as per NJDEP regulations.

5. Manholes shall be vacuum tested for infiltration in accordance with ASTM C1244. All pipes in this structure shall be plugged at the inside face of the manhole.

a. A vacuum shall be pulled on the manhole equal to 10-inches Hg. Vacuum shall be turned off and all valves closed.

b. The vacuum shall be held as shown in the following table:

Manhole Diameter	Time
48”	60 sec.
60”	75 sec.
72”	90 sec.
>72”	+15 sec./12 diameter

6. Determine test time for large diameter pipe (>24”) or when laterals are included in the main being tested:

$T = 0.085*DK/Q$
(for mains only)

$T = 0.085[(D^2*L) + (d_L*L_T) / (D*L) + (d_L*L_T)] * (1.0 / 0.0015)$
(for sewer mains and laterals)

Where:

T = shortest time to drop 1.0 psig

$K = 0.000419$ DL
(must not be less than 1.0)

$K = 0.000419[(D*L) + (d_L*L)]$
(in cases where the laterals are included in the testing)

Q = 0.0015 cubic feet/minute/square feet of internal surface area

D = pipe nominal diameter (inches)

d_L = lateral diameter (inches)

L = length of pipe reach tested
(the time to drop 0.5 psig shall be equal to half of T as calculated)

L_T = total length of laterals included in test

7. Deflection testing for PVC, HDPE, and other;

a. A 7½% deflection mandrel shall be pulled through the entire pipe length by hand, without mechanical assistance.

8. All sanitary, storm, or combined sewer shall also be visually inspected by Lamping Method.

D. Repairs: Damaged pipe sections, crooked pipe sections, sections with excessive deflection or leaking joints are unacceptable and shall be corrected and retested. Chemical grouting is not acceptable repair for newly installed pipe and will not be permitted.

Damaged pipe sections immediately adjacent to manholes shall be repaired by replacement of the sections. Methods of repairing other pipe sections shall be submitted for approval with shop drawings or catalog cuts of devices proposed for use.

Repair sleeves shall be full circle type, utilizing a corrosion resistant steel sleeve which covers the entire repair. The sleeve shall be lined with a gasket composed of 100% natural rubber or neoprene. The entire assembly shall be tightly clamped with corrosion resistant bolts fitted into malleable or

ductile iron lugs designed to eliminate bending. Sleeves shall be Dresser 360° or Smith-Blair Full Circle or AJMC Industries 101, 102 or approved equal.

E. Acceptance of New Sewer System

Prior to acceptance by the City of Elizabeth, the Applicant's Engineer will certify to the City of Elizabeth, and the State, where necessary, that all plans and specifications were prepared in accordance with the City of Elizabeth 's Rules and Regulations and with the requirements of the NJDEP, that actual construction costs were not significantly different from the originally submitted cost estimates and that the construction has been in conformance with the approved plans and specifications.

It should be noted that the sewer lateral from the first clean-out at the street onto a private property belongs to the property owner. The property owner has the sole responsibility of maintenance and repair of that section of sewer lateral.

F. Record Drawings and Manuals

Upon completion of construction and prior to City of Elizabeth acceptance of the new sewer system, complete As-built Drawings and/or Manuals must be submitted to the City of Elizabeth. They must be signed and sealed by a New Jersey Licensed Professional Engineer or Land Surveyor. They must meet all the requirements of the City of Elizabeth's "Submission of Record Drawings for Extension of Water/Sewer Mains and other Water/Wastewater Facilities," current revision.

3.3 CONSTRUCTION OF MANHOLES

A. All precast bases shall be placed on a 12-inch thick bed of 1½"' crushed stone (No. 4), or as indicated on plans and details, conforming to NJDOT Standard Specifications Section 901.

B. Bottom channels shall be formed to the crown of the outlet pipe with concrete in all manholes.

C. All lift holes on all precast elements shall be completely filled with an approved bitumastic material. All joints between all precast elements shall be made with an approved bitumastic material or an approved rubber gasket.

D. Casting shall be set in a full bed of Portland cement mortar.

E. Excavation and backfill shall be as specified herein, and on the drawings.

3.4 CLEAN-UP

A. Upon completion of the Work, all surplus materials, debris, tools, and equipment shall be removed from the site.

END OF SECTION 333000

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide all materials, labor, equipment and services and perform all operations in connection with storm drainage complete, in accordance with the Drawings and Specifications, and as follows:

1. Storm drainage outside the building including but not limited to storm sewer piping, watertight joints, manholes, inlets, cleanouts, roof drains, stormwater management facilities including: underground detention system.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, govern the work of this section.

B. Geotechnical Report for Caldwell & Elizabethtown Parking Garage prepared by Remington & Vernick Engineers dated December 14, 2020.

C. City of Elizabeth Standard requirements for new sewer and service laterals.

D. National Standard Plumbing Code, latest edition.

E. Related work specified elsewhere:

1. Section 31 10 00 – Site Preparation
2. Section 31 20 00 – Earth Moving
3. Section 03 30 00 – Site Cast-In-Place Concrete

1.3 DEFINITIONS

A. PVC: Polyvinyl Chloride.

B. RCP: Reinforced Concrete Pipe

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes and other structures, including frames, covers, and grates.
2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than one week in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

1.8 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining to storm drainage systems.

B. City of Elizabeth Compliance: Comply with regulations pertaining to storm drainage systems, including required testing.

PART 2 - PRODUCTS

2.1 DRAINAGE PIPE AND FITTING

A. Piping and fittings shall be supplied as required to complete the site storm drainage work.

B. Fittings shall be supplied as required. Fittings produced by manufacturers other than the supplier of the pipe shall not be permitted.

C. Storm Sewer:

1. Reinforced Concrete Pipe (RCP) in accordance with ASTM C76, Class III unless indicated otherwise on the Drawings. Gaskets shall be in accordance with ASTM C443, rubber compression gaskets installed in accordance with manufacturer’s published instructions.
2. Roof Drains: Polyvinyl Chloride (PVC) Schedule 40. ASTM D1785, fittings/couplings to be solvent welded.

D. Roof Drain, Footing Drain, Riser: Polyvinyl Chloride (PVC) Schedule 40. ASTM D 1785, fittings/couplings to be solvent welded.

2.2 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches or 72 inches minimum, unless otherwise indicated.

2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match the diameter opening of the frame and cover.
8. Joint Sealant: ASTM C990 bitumen or butyl rubber.
9. Resilient Pipe Connectors: ASTM C923 cast or fitted into manhole walls, for each pipe connection.

2.3 FRAMES AND COVERS

A. Manhole and inlet frames, covers, steps, materials, and equipment in this classification shall be of the type and duty shown on the Drawings and in accordance with City of Elizabeth Standards. Iron castings shall conform to ASTM A536 and shall be designed for heavy-duty traffic.

B. Physical Requirements: Castings shall be true-to-pattern in form and dimension, free from faults, sponginess, cracks, blowholes, and other defects affecting their strength.

2.4 CLEANOUTS

A. PVC with cast-iron adapter.

2.5 STORMWATER INLETS

A. Inlets: ASTM C913, precast reinforced concrete, of depth indicated; Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates as indicated on the Drawings.

1. Frames and Grates: Heavy-duty frames and grates according to City of Elizabeth standards.
2. Joint Sealant: ASTM C990 bitumen or butyl rubber.
3. Resilient Pipe Connectors: ASTM C923 cast or fitted into manhole walls, for each pipe connection.

2.6 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cement ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cement ratio.

1. Include channels and benches in manholes.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to eight-tenths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: One-tenth drop through manhole, (Minimum), unless otherwise noted.

b. Benches: Concrete, sloped to drain into channel.

1) Slope: 8 percent.
2) Include channels in inlets.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.7 SAND

A. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling specified in Section 312000 – Earth Moving.

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 – Earth Moving. Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include silt-tight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. Reinforced Concrete Pipe, as needed: ANSI/ASTM C76, Class III, bell and spigot end joints unless specified otherwise.

2. PVC Schedule 40 Pipe: Couplings to be solvent welded unless specified otherwise.

3.4 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. For HDPE: Bell and spigot joint with rubber compression gasket joint conforming to AASHTO M252, AASHTO M294 or ASTM F2306. Gaskets meeting requirements of ASTM F477 shall be installed by the pipe manufacturer and covered with a removable wrap. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

C. For PVC Schedule 40: Coupling to be solvent welded.

D. Join piping made of different materials or dimensions with couplings made for this application use couplings that are compatible with and that fit both systems materials and dimensions.

3.6 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories as indicated on drawings.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.7 STORM DRAINAGE INLET AND OUTLET STRUCTURE INSTALLATION

A. Construct inlets and outlet structures as indicated on drawings.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R and Section 03 30 00 – Site Cast-in-place concrete.

3.9 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 334000

SECTION 033000 - SITE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and install all cast-in-place concrete including curbs, walkways, aprons, equipment pads, ramps and exterior stairs as shown on the Contract Drawings and specified herein.

B. Pavement Marking Paint

C. Paving Joint Sealers

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, govern the work of this section.

B. Related Sections

1. Section 31 20 00 – Earth Moving
2. Section 33 40 00 – Storm Drainage
3. Section 33 10 00 – Site Water Lines
4. Section 33 30 00 – Site Sanitary Sewerage Systems
5. Section 32 13 13 – Portland Cement Concrete Paving

1.3 QUALITY ASSURANCE

A. The work shall comply with the latest edition of the AASHTO Standards Specifications for Highway Bridges.

B. Where provisions of Federal, State or local building codes having jurisdiction over this Project are more stringent than the above standards, the Federal, State or local building codes shall govern.

C. Contractor Qualifications: Contractor shall have the equipment and experienced personnel to perform the concrete work as shown and as specified. The Contractor shall list at least five projects which the Contractor has successfully completed equal in quality and magnitude to this Project.

1.4 SUBMITTALS

A. Provide samples, manufacturer's product data, laboratory test reports, and materials' certifications as required in referenced Sections for concrete and joint fillers and sealers. Statements of materials and quantities.

B. Product Data: Proprietary materials, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials and others if requested by Architect. Concrete delivery tickets.

C. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Shop drawings of reinforcement, shall be provided.

D. Concrete test results.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ready Mix Concrete: Shall conform to ASTM C 94, Alternate No. 2.

B. Portland Cement: Shall conform to ASTM C 150, Type I or II; Type IA or IIA for air entrained concrete.

C. Different brands of cement or the same brand of cement from different mills shall not be used in any structure unless authorized in writing. Only those cements which can produce similar color in the concrete of any structure will be authorized.

D. Aggregates:

1. Fine Aggregate: Shall conform to ASTM C 33; washed and processed natural sand having strong, hard, durable particles and containing no more than 2 percent by weight of deleterious matter such as clay lumps, mica, shale or schist. Fine aggregate shall be graded within the following limits:

Sieve Size	Percent	
	Minimum	Maximum
3/8”	100	--
No. 4	95	100
No. 8	80	100
No. 16	50	85
No. 30	25	60
No. 50	10	30
No. 100	2	10
No. 200	0	3

2. Coarse Aggregate: Shall conform to ASTM C 33; washed and processed clean, hard, fine grained, sound crushed rock or gravel or combination of both, containing not more than 5 percent by weight of flat, thin, elongated, friable, or laminated pieces, nor more than 2 percent of shale or cherty material.

a. Any piece having a length in excess of five times the average thickness shall be considered flat or elongated.
b. Coarse aggregate shall be graded within the following limits:

Sieve Size	Percent	
	Minimum	Maximum
¾”	90	100
3/8”	20	55
No. 4	0	10
No. 8	0	5

E. Water: Shall be clean and free of oil, acid, alkali, salt, sugar, vegetable, or other substances injurious to the finished product.

F. Admixtures: Shall be used only when approved by the Construction Manager.

1. Admixture for Water Reduction: Shall conform to ASTM C 494, Type A.

    a. High Range Water Reducing Admixture (Superplasticizer): Shall conform to ASTM C 494, Type F or G.

2. Admixture for Acceleration: Shall conform to ASTM C 494, Type C and E and have long-term test proof of non-corrosive properties on reinforcing steel.
3. Admixture for Air-Entraining: Shall conform to ASTM C 260.
4. Calcium chloride or admixtures containing more than 0.1 percent chloride ions will not be permitted.
5. Certification: Written conformance to above admixture requirements and the chloride ion content shall be required from the admixture manufacturer prior to mix design review.

G. Curing Membrane Sheet: Reinforced waterproof paper, white polyethylene film or white burlap-polyethylene sheet, conforming to the requirements of ASTM C 171.

H. Premolded Joint Filler: Conform to ASTM D1751.

I. Joint Sealer: Hot-poured joint sealant conforming to ASTM D 3405.

J. Epoxy Waterproofing Seal Coat: Shall be a two-component, epoxy-resin, waterproofing system for application to Portland cement concrete. The coating shall conform to ASTM C 881. The system type, grade, and class shall depend on the condition of intended use.

2.2 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Weakened-Plane (Contraction) Joints: Form weakened-plane (contraction) joints, sectioning concrete into areas as shown on Drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, with one of the following methods:

1. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8" wide joints into hardened concrete as soon as surface will not be torn, abated, or otherwise damaged by cutting action.
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces. Provide 1/4" radius.

C. Construction Joints: Set construction joints at side and at end terminations of pavement and at locations where placement operations are stopped for more than 1/2 hour, unless pavement terminates at isolation joints.

1. Construct joints as shown or, if not shown, use standard galvanized steel or plastic keyway-section forms, or bulkhead forms with keys. Embed keys at least 1-1/2" into concrete.

2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
3. Provide tie bars at sides of pavement strips where indicated.

D. Isolation Joints: Provide pre-molded joint filler for isolation joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20' for each pavement lane unless otherwise indicated.
2. Extend joint fillers full width and depth of joint. Terminate joint filler less than 1/2" or more than 1" below finished surface if joint sealant is indicated. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
3. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
4. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces. Provide 1/4" radius, unless noted otherwise.

PART 3 - EXECUTION

3.1 DESIGN AND TESTING

A. The concrete supplier shall design the concrete mix as specified. Ready-mix concrete shall be proportioned and mixed to obtain the compressive strengths as noted and as specified. Concrete shall develop the noted compressive strengths at 28 days with normal Portland cement and within seven days with high early cement or Type I Portland cement plus the non-chloride accelerator.

B. The testing and inspection of concrete shall be performed by the Owner’s Testing Agency. Any testing performed for the convenience of the Contractor shall be at no cost to the Owner.

C. Prior to delivering any concrete, furnish a statement of materials giving for each type and class of concrete, the following information:

1. Type and brand name of cement.
2. Type and brand name of all admixtures used.
3. Quantities of all ingredients.

D. During progress of the work, compression tests shall be made for each day of concrete placing. For major placements, a minimum of one test per 50 cubic yards of concrete placed, or fraction thereof, shall be required.

E. Unless otherwise directed, a minimum of four cylinders shall be taken for each test. The cylinders shall be standard size, 6 inches in diameter and 12 inches long and shall be made in accordance with ASTM C 31. Testing shall be in accordance with ASTM C 39. For normal Portland cement, two cylinders each shall be crushed at seven days and 28 days, respectively. For high early concrete, two cylinders each shall be crushed at three days and seven days, respectively.

1. Unless otherwise directed, a minimum of one standard slump test shall be taken for each two

compressive test cylinders. Slump tests shall be performed in accordance with ASTM C 143. Maximum slump shall be 4 inches unless otherwise specified.

2. All concrete samples shall be obtained in accordance with ASTM C 172 and transported to a place as directed where tests can be made and cylinders stored without being disturbed for the first 24 hours.
3. The Contractor shall provide and maintain a wet-bath curing box on site for curing and storing of concrete test cylinders for the duration of the Contract in accordance with ASTM C 192.

3.2 PROPORTIONING OF CONCRETE

A. Composition: The concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, and as required, admixture and an air-entraining agent.

B. Proportioning: The concrete shall be homogeneous, readily placeable and uniformly workable, and shall be proportioned to attain properties of strength, slump, entrained air content and rate of hardening in compliance with the following requirements:

Design Compressive Strength (28 day)	Slump (Inch)	Percent Air Entrainment
4,500 psi	3 ± 1	6.0 ± 1.5
4,000 psi	3 ± 1	6.0 ± 1.5
3,000 psi	3 ± 1	6.0 ± 1.5

3.3 GUARANTEE

A. The concrete supplier shall guarantee the compressive strength specified. The slump, when discharged from the mixer, shall be within the limits specified.

B. Should the 28 day compression tests show a lower strength than specified, the Construction Manager will then have a laboratory make impact hammer tests or Windsor Probe or take test cores from the area affected, secured and prepared according to ASTM C 42, or make load tests. Should these tests show the concrete to be below the strength specified, the entire affected area shall be removed and replaced by the Contractor, at no additional expense, including the cost of taking cores and testing them.

3.4 LIMITATIONS OF PLACING

A. At least 30 days prior to the placement of concrete, a plan of action shall be submitted for approval for the placement of concrete during hot and cold weather conditions as defined herein. In no case, during mixing and placement, shall the temperature of the concrete be less than 50 °F or more than 90 °F. When the ambient temperature reaches 75 °F, the provisions of hot weather concreting, as specified below, shall apply. When the temperature of the plastic concrete reaches 85 °F, immediate steps shall be taken to cool either the mixing water or the aggregates, or both, in accordance with the plan of action. In no case shall concrete be placed when its temperature in the plastic state at the completion of mixing exceeds 90 °F.

B. Cold and hot weather concreting shall be in accordance with the following:

1. Cold Weather Concreting. When the Construction Manager determines that cold weather conditions exist, measures shall be provided by the Contractor to maintain the concrete temperature between 40 and 80 °F.

2. Hot Weather Concreting. When the ambient temperature reaches 75 °F, one or more of the following precautions shall be followed:

   a. Schedule work so that concrete can be placed with the least possible delay and, if necessary, start placing during late afternoon, at night or early morning.
   b. Use a water-reducing admixture or a water-reducing and retarding admixture in accordance with the manufacturer's recommendations. When more than one admixture is used, they shall be from the same manufacturer.
   c. Sprinkle the coarse aggregate stockpile to cool it by evaporation.
   d. Use chilled mixing water or shaved ice to replace part of the mixing water as recommended in ACI 305R, Subpart 2.3.6.
   e. In the case of truck mixing, do not rotate the drum during and after the addition of cement to the mix until mixing water is added at the construction site. This may require reduced loads or the utilization of horizontal type mixers.
   f. Prevent absorption by sprinkling the underlying material and the wood forms just before placing so that they do not absorb water from the mix.
   g. Erect windbreaks to prevent winds from drying exposed concrete surfaces while they are being finished.
   h. Screed and float concrete as it is placed and start curing immediately.

3.5 PROTECTION OF UNDERGROUND WORK

A. Care shall be taken not to damage or displace underground piping and conduit. The Contractor shall be responsible for any damage caused by his work to new or existing underground work.

3.6 MEASURING, MIXING AND DELIVERY OF CONCRETE

A. General: Unless otherwise directed, the concrete ingredients shall be measured, mixed and delivered in truck mixers in accordance with ASTM C 94, Alt. No. 2.

B. Job Mixed Concrete: If approved, for small quantities of concrete, job mixed concrete shall be mixed in an approved type batch mixer. Do not exceed manufacturer's rated capacity of mixer.

C. Ready (Truck) Mixed Concrete: With each batch of concrete delivered to the Project, the concrete supplier shall furnish duplicate batch delivery tickets as required by ASTM C 94.

3.7 PLACING CONCRETE

A. Concrete shall not be placed until forms and all reinforcing steel has been placed, inspected and approved. The forms shall be clean of all debris immediately prior to placing concrete, and surfaces not oil treated shall be wetted. Concrete shall be placed so that segregation does not occur and there is no displacement of reinforcement. Concrete shall be placed in the forms as nearly as practical in its final position in order to avoid rehandling, and a horizontal surface of the plastic concrete shall be maintained. After initial set of the concrete, forms shall not be jarred and no strain shall be placed on the ends of projecting reinforcement. Concrete shall not be placed until all laitance which may have formed on concrete previously placed or any loose, deleterious material on reinforcing bars has been removed. Concrete may not be placed if the concrete temperature at the time of placement is greater than 90 °F, and concrete that is more than 12 hours old from time of batching will be rejected.

B. The external surface of all concrete shall be worked during the placing so as to force all coarse aggregate from the surface and to bring mortar against the forms to produce a smooth finish substantially free from water and air pockets or honeycombs.

C. Chutes and Troughs: Concrete shall not be dumped or dropped for a distance greater than 5 feet, unless confined by closed chutes or pipes. All chutes, troughs and pipes shall be kept clean and free from coatings of hardened concrete by flushing with water after each run. The water used for flushing shall be discharged outside of the forms and clear of the concrete already in place.

D. Vibrating: The concrete shall be compacted with mechanical vibrators operating within the concrete. When required, vibrating shall be supplemented by hand spading to assure proper and adequate compaction. Vibrators shall be so manipulated as to work the concrete around the reinforcement and embedded fixtures and into corners and angles of the forms.

Vibrators shall not be used as a means to cause concrete to flow or run into position. The vibration at any point shall be of sufficient duration to accomplish compaction, but shall not be prolonged to the point where segregation occurs.

At least one additional standby vibrating unit shall be available for individual concrete placements in excess of 10 cubic yards.

E. Construction and Contraction Joints: Construction or contraction joints shall be located only where shown on the Contract Drawings or where authorized. If joints are to be located other than where shown on the Contract Drawings, shop drawings indicated their location must be submitted for approval. Newly placed concrete in contact with previously placed concrete (at horizontal construction joints and at contact with existing concrete structures where the joints are exposed to view in the finished structure) shall contain an excess of mortar to insure bond and provide a neat joint. In order to provide sufficient mortar for such joints, a layer of Portland cement mortar, 1 to 2 inches thick, shall be deposited against the existing concrete into which the regular mix concrete shall be deposited immediately. The cement-sand mortar shall be of the same proportions as in the regular concrete mix except that the coarse aggregate is omitted.

F. Expansion Joints:

1. Open Joints: Open joints shall be constructed by insertion and subsequent removal of a wooden strip or metal plate. The insertion and removal of the template shall be accomplished without chipping or breaking the corners of the concrete. Reinforcement shall not extend across an open joint.
2. Filled Joints: Expansion joints shall be constructed similarly to open joints.

    a. When preformed bituminous, cork, sponge rubber or other material is specified, it shall be cut to the same shape and size as that of the surfaces being jointed. It shall be fixed firmly against the surface of the concrete already in place in such manner that it is not displaced when concrete is deposited against it. When more than one piece of filler is used, the abutting pieces shall be covered with a layer of asphalt-saturated A40-pound of roofing felt, one side of which shall be covered with hot asphalt to insure proper retention.
    b. When preformed elastomeric joint seals are specified, the sealer shall be installed as soon as practicable after the concrete curing period using a lubricant-adhesive. Temperature limitations of the adhesive as recommended by the manufacturer shall be observed. Joints shall be cleaned and shall be free of oil, curing compound and all other foreign materials immediately prior to the application of the lubricant-adhesive.

        The sealer shall be furnished and installed in a continuous length across the full width of slab unless otherwise authorized in writing.

        The sealer shall be installed by the use of hand or machine tools and secured in

place with the lubricant-adhesive which shall cover both sides of the sealer over the full area in contact with the concrete. The adhesive may be applied to the concrete or the sealer or both.

G. Drainage and Weep Holes. Drainage and weep holes shall be constructed in the manner and at the locations required. Forms for weep holes through concrete shall be 4-inch polyvinyl chloride drain pipe.

H. Pipes, Conduits, and Ducts. Pipes, conduits, and ducts encased in concrete shall be installed before the concrete is placed. Pipes shall be held or braced rigidly during concrete placement in order to prevent their displacement.

I. Pumped Concrete. At least 20 calendar days prior to beginning operations, a plan of operation conforming to ACI 304.2R shall be submitted for approval, showing method and procedures along with a list of adequate description of equipment and manpower proposed for use, including contingency equipment and manpower. The equipment shall be so arranged that no vibrations result which might damage freshly placed concrete. Aluminum alloy pipe will not be permitted as a conveyance for the concrete nor for any pieces of equipment in contact with the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there is no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be cleaned.

3.8 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/4 inch in 10 feet.
2. Vertical face on longitudinal axis not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

D. Slope step treads at 1/4 inch per foot to drain.

3.9 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement, with recommendations in CRSI's "Placing Reinforcing Bars" and as specified in Division 3 Sections, for placing and supporting reinforcement.

B. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2" overlap to adjust mats.

3.10 REMOVAL OF FORMS AND FALSEWORK

A. Unless concrete strength test specimens are required as controls for form stripping and structure loading, the requirements herein shall apply.

B. Superstructure load shall not be placed upon finished piers or abutments until authorized, but the minimum time allowed for the hardening of concrete in the substructure before any load of the superstructure is placed thereon shall be 14 calendar days.

C. Forms and falsework shall not be loosened, disturbed or removed without authorization. Blocks and bracing shall be removed at the time the forms are removed and in no case shall any portion of the wood forms be left in the concrete.

D. Falsework removal for continuous or cantilevered structures shall be such that the structure is gradually subjected to its working stress. To facilitate finishing, forms used on ornamental work, railings and parapets shall be removed in not less than 12 nor more than 48 hours, depending upon weather conditions.

E. Forms and their supports may be removed from under beams and deck slabs after the expiration of 14 calendar days, and wall forms and side forms for beams carrying no loads after one calendar day.

F. Precautions shall be exercised with respect to form removal and load applications for portland cement concrete containing fly ash since the rate of strength development may be slower.

3.11 FINISHING CONCRETE SURFACE

A. The surface of the concrete shall be finished immediately after form removal.

B. All concrete surfaces exposed to view shall be given a Class 2 rubbed finish. All other concrete surfaces shall be given a Class 1 ordinary surface finish.

C. The classes of concrete finish are as follows:

1. Class 1, Ordinary Surface Finish. As soon as the forms are removed, all projecting wire or metal devices that have been used for holding the forms in place and which pass through the body of the concrete, shall be removed or cut back at least 1 inch beneath the surface of the concrete. Lips of mortar and all irregularities caused by form joints shall be removed.

   All small holes, depressions and voids that show upon the removal of forms shall be filled with cement mortar mixed in the same proportions as that used in the body of the work. In patching larger holes and honeycombs, all coarse or broken material shall be chipped away until a dense uniform surface of concrete exposing solid coarse aggregate is obtained. Feathered edges shall be cut away to form faces perpendicular to the surface. All surfaces of the cavity shall be saturated with water, after which a thin layer of neat cement mortar shall be applied. The cavity shall then be filled with stiff mortar composed of one part of portland cement to two parts of sand, which shall be tamped into place. The mortar shall be preshrunk by mixing approximately 30 minutes before using (the length of time may be varied in accordance with the brand of cement used, temperature, humidity and other local conditions). The surface of this mortar shall be floated with a wooden float before initial set takes place. The patch shall be kept wet for a period of five calendar days.

   For patching large or deep areas, coarse aggregate shall be added to the patching material and precautions shall be taken to ensure a dense, well bonded and cured patch.

   Areas having excessive honeycombs may be considered cause for rejection of a structure. Where written notice is given that a structure has been rejected, said structure shall be removed and rebuilt, in part or wholly, as specified, without additional compensation.

   All construction and expansion joints shall be tooled and free of all mortar and concrete.

2. Class 2, Rubbed Finish. After removal of forms, the rubbing of concrete shall be started as soon as its condition permits. Immediately before starting this work, the concrete shall be kept saturated with water. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing to set. Surfaces shall be rubbed with a wetted wooden block or a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. The carborundum stone shall not be used until the concrete has hardened to the state where the sand grinds rather than ravels or rolls. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place. A brush finish or painting with grout will not be permitted.

   After all concrete above the surface being finished has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

3.12 CURING AND PROTECTING CONCRETE

A. Curbs, and tops of sidewalks shall be cured in accordance with the following:

1. The concrete shall be covered with strips of wet burlap which, after shrinkage, shall be not less than 2 feet 6 inches longer than the width of the slab. Approximately 2 feet shall be allowed for shrinkage of new burlap. The strips shall be laid across the slab and shall overlap not less than one-half the width of the strip to provide a double thickness of burlap. The burlap shall be maintained in a wet condition throughout the specified curing period. The minimum wet cure period shall not be less than seven calendar days.

2. If a pipeline is to be used to furnish water for sprinkling, it shall have tees and stopcocks not more than 200 feet apart. If this pipeline is used for supplying water for the concrete mixer and other operations, it shall be of sufficient size and operated under sufficient pressure to serve all such operations and to permit sprinkling of the curing material and shall not be removed from the site of sprinkling until the curing period is over.

3. The wet burlap shall be covered with white polyethylene sheeting. The sheeting shall be placed and weighted down so as to remain in contact with the surface covered. The sheeting shall extend beyond the edges of the slab for a distance at least twice that of the thickness of the concrete. The covering shall be maintained in place for 72 hours after the concrete has been placed.

B. Other concrete structures and concrete surfaces to receive an epoxy coating, rubbed finish or to be covered with another material shall be cured as mentioned above or in accordance with the following:

1. Waterproof paper blankets shall be not less than 20 feet nor more than 75 feet in length and shall be of a width so that, when in place, they completely cover the surface of the concrete. Unless the paper has been pretreated to resist such action, an 8-inch pleat to allow for shrinkage of the paper joints in the blankets shall be cemented together to provide seams with a minimum lap of 4 inches, producing and maintaining a waterproof joint.

   The blankets shall be securely weighted down by placing a ridge of earth or light planks on the edges of the blankets just inside the forms or by other approved means such that depressions are not formed in the concrete surface. Adjoining blankets shall overlap not less than 12 inches. This lap shall also be securely weighted down to form a closed joint. If hair-

checking develops before the paper can be placed, the concrete shall be covered initially with wet burlap.

Before moving the blankets ahead to new locations, the blankets shall be inspected and all holes and tears shall be repaired with centered patches. When the blankets are no longer serviceable as a single unit, selections may be made from the rejected blankets which, if approved, may serve for further applications, provided that two blankets are used as a single unit. However, the double blanket may be rejected if it no longer provides an airtight cover.

2. Hay or Straw: The entire surface of the concrete shall be covered with a layer of hay or straw not less than 6 inches uniform thickness which shall be placed directly upon the concrete and wet by sprinkling.

C. Protection and Curing Under Cold Weather Conditions: During cold weather, measures shall be taken to maintain the concrete temperature as specified in Section 3.4 above.

If concrete is placed or is scheduled to be placed at a time when the provisions for cold weather concreting apply, the Construction Manager shall be advised of the plans for curing and protecting the concrete. Concrete shall be protected in such a manner as to prevent damage from cold weather. Frozen concrete or concrete damaged by cold weather shall be removed and replaced without additional compensation.

Calendar days on which the surface temperature of the concrete falls below the minimum specified shall not be considered curing days.

Protection under cold weather conditions may be accomplished by heating and housing and by the use of insulated forms as follows:

1. General: Forms shall be free of ice, snow and frost at time of placing concrete. No substructure concrete shall be placed when the ambient temperature is below 40 1F, unless the interior of forms, metal surfaces and the surface of the concrete adjacent to the new concrete placement are preheated to that temperature or higher.

Certain procedures and requirements must be adhered to when protecting superstructure concrete. The top of the freshly placed concrete shall be protected as soon as possible with insulating blankets. Tarpaulins or other similar material shall be hung so that the entire section being protected is enclosed. Heated air shall be circulated under this enclosed portion for the full protection period as specified for concrete protected by heating and housing. No superstructure concrete shall be placed when the ambient temperature is below 40 1F, unless the interior of the forms, metal surfaces, and the surface of the concrete adjacent to the new concrete placement are preheated to that temperature or higher.

The concrete shall be kept at a temperature not lower than 60 1F for a period of seven calendar days after placing and then, at a temperature not lower than 40 1F for a period of four calendar days.

After the specified curing is complete, the temperature of the concrete shall not be permitted to fall at a rate greater than 10 1F per 12-hour period.

2. Heating and Housing: Before placing concrete in the forms, housing shall be provided for the section of concrete to be placed so that the temperatures specified can be maintained within such enclosure. Enclosures shall be so arranged as to permit removal of forms and finishing of concrete surfaces without interruption of heating.

The heating system shall be so arranged as to provide uniform heating by forced air or radiation within the enclosure. The heating system shall be operated for a sufficient period of time in advance of placing concrete so that the temperature of form surfaces to be in contact with the concrete, reinforcing steel and abutting construction shall be 70 plus 10 or minus 20 1F.

During and after the period of placing concrete, the heating plant shall be operated so as to maintain the temperature of the air within the enclosure at 70 plus 10 or minus 20 1F. Such temperatures shall be maintained in the enclosure until the completion of the curing period.

Salamanders shall be provided at the site or be available within an hour in such quantity as to ensure maintaining the concrete at the minimum temperature specified in the event of a breakdown, and shall be used for such reasonable time as to permit repair of the heating plant, subject to such location, arrangement, operation and provision for moisture.

3. Insulated Forms: Insulated forms may be used to protect concrete in abutments, walls and other structure units. The insulation shall be of a type, which meets the requirements of cold-weather concreting.

The temperature of the concrete and the temperature of the surface of the forms under the insulation will be checked at intervals, and the temperature of the concrete being mixed shall be adjusted to ensure that the rate of increase in concrete temperature after placement is not greater than 10 1F per hour. Maximum concrete temperatures shall not be greater than 100 1F.

The insulated forms shall remain in place for the protection period. The blankets or straw may be removed from tops of footings only as necessary to permit forming for subsequent concrete placements. Approval shall be obtained before loosening forms or removing the top covering.

3.13 SEALING OF JOINTS

A. Prior to sealing joints with hot-poured rubber asphalt or cold applied joint sealer, the surfaces of the seams and joints must be clean and dry, and must be free of all loose aggregate, paint, corrosion, form oil and concrete curing compound.

B. All loose concrete, dirt and foreign matter shall be removed by sandblasting or by the use of a wire brush. Projections of concrete into the seams shall also be removed. The joints and surfaces adjacent to the seams shall be blown free from all loose dust by means of oil-free compressed air immediately prior to priming.

C. Alkaline seepage and form oil shall be cleaned by etching of the concrete surface with hydrochloric acid, thorough rinsing, neutralizing and drying.

D. The sealing compound shall be made flush with or not more than 1/16 inch above the adjacent surfaces.

END OF SECTION 033000

SECTION 323119 - METAL SECURITY GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Window guards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal window guards that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: The Basis of Design Manufacturer for window guards products are manufactured by Ametco Manufacturing Corporation. Subject to compliance with requirement, provide products by the Basis-of-Design manufacturer or equal.

2.2 MATERIALS

A. Bars: Hot-rolled steel members; ASTM A36; Cold-rolled steel members: ASTM A611, Grade C.

B. Plates, Shapes, and Bars: ASTM A 36.

C. Tubing: ASTM A 500, cold-formed steel tubing.

D. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A 1011, Structural Steel, Grade 45.

E. Castings: Either gray or malleable iron unless otherwise indicated.

2.3 WINDOW GUARDS

A. General: Window guards consisting of modular open grille panels fabricated by welding flat vertical steel and perimeter bars and horizontal cross rods.

1. Guard Height and Width: As shown.
2. Guard Spacing: As shown.

B. Frame Corner Construction: Welded.

C. Steel Finish: Shop painted.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Connection and expansion bolts; galvanize or stainless steel.

2.5 FACTORY FINISHING

A. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123. For hardware items, hot-dip galvanize to comply with ASTM A 153.

B. Polyester Powder Coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate. Color selected by Architect from manufacturer's standard offerings.

1. Minimum hardness measured in accordance with ASTM D3363: 2H.
2. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.
3. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than 3/16 inch undercutting.
4. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for construction layout, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLTION OF WINDOW GUARDS

A. Verify that openings fit allowable tolerances are plumb, level, provide a solid anchoring surface and comply with approved shop drawings. Plumb and align faces in a single plane and erect window guards square and true adequately anchored.

B. Install guards according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means

END OF SECTION 323119

APPENDIX 1

GEOTECHNICAL INVESTIGATION REPORT

Caldwell & Elizabethtown Parking Garage

Caldwell Place and Elizabethtown Plaza
Elizabeth, Union County, New Jersey

Geotechnical Investigation Report

December 14, 2020

Prepared for:
Union County
2325 South Avenue
Scotch Plains, NJ 07076

Prepared by:
Remington & Vernick Engineers
51 Haddonfield Road, Suite 260
Cherry Hill, New Jersey 08002
Office Phone: (856) 795-9595
RVE Project Number: 2000F020

Submitted by:
K. Charles Westen, PE
NJ License No. 47013

Signature

December 14, 2020
Date

REMINGTON & VERNICK ENGINEERS

GEOTECHNICAL INVESTIGATION REPORT

Table of Contents

INTRODUCTION

Remington & Vernick Engineers (RVE) has prepared this report which presents the findings, conclusions, and recommendations of a geotechnical investigation conducted for the proposed construction of the new Caldwell & Elizabethtown Parking Garage. The proposed parking garage will be constructed within the same location of the existing parking facility after demolition is completed. The parking garage site is located at the intersection of Caldwell Place and Elizabethtown Plaza in the City of Elizabeth, Union County, New Jersey.

The purpose of this geotechnical investigation is to determine the subsurface conditions at the site, the depth to bedrock and to provide recommendations, from a geotechnical engineering viewpoint, for the most suitable type of foundation, site preparation, earthwork operations, and other geotechnical considerations.

SITE & PROJECT DESCRIPTION

The existing parking facility is a 7-story reinforced concrete structure with below grade parking, with the upper story having office space, utilized by the County Sherriff's office. The existing parking structure, including the below grade parking level, will be demolished, and removed in its entirety to allow for construction of the new parking structure. Based on preliminary information, the proposed footprint of the new parking structure will be located in approximately the same location as the existing structure.

The proposed new parking structure will be a 9-story structure, with a basement for below grade parking. The structure will be constructed using precast concrete members with reinforced cast-in-place concrete foundation. The depth of the proposed basement will vary from approximately 3.2 to 15.8 feet below existing grade. The parking structure is expected to be supported by a spread footing foundation system consisting of continuous wall and isolated column footings. The anticipated maximum wall and column loads are expected to 22 kips per liner foot and 325 kips respectively, with anticipated exterior column spacing of 30 feet. These anticipated loads and column spacing was provided to us by the Project Architect. The final exterior site grades are expected to change from those that currently exist at the site.

SUBSURFACE INVESTIGATION

A Standard Penetration Test (SPT) boring investigation for this project was performed on October 27, 28 and 29, 2020. The investigation consisted of seven (7) SPT test borings drilled by Sano Drilling Inc., utilizing drilled in casing (hollow stem augers) at locations selected by RVE. The soil borings, designated as B-1 through B-7, were drilled to auger refusal at depths ranging from 10 to 15 feet below existing grade. At auger refusal, rock cores were performed in each boring into bedrock with the core runs measuring 5 feet in depth. All drilling, soil sampling and rock coring operations were supervised by RVE. The field logging of the soil and rock core samples was also performed by a representative of RVE.

Soil samples were recovered via a two-inch O.D. split-spoon sampler; driven by a hydraulically activated 140-pound hammer, free falling 30 inches (ASTM D 1586). The number of hammer blows required to advance the 24-inch spoon in 6-inch increments (four increments in all) were recorded. The number of blows required to penetrate the middle two increments (6 to 18 inches) is known as the Standard Penetration Resistance (N). Soil samples were obtained continuously in the upper 10 ft and at 5 ft intervals thereafter. Recovered soil samples were visually classified in

the field using the *Burmister Soil Identification* System and the *Unified Soil Classification System.*

All rock coring was performed using a 5-foot NX-size double tube core barrel. The recovered rock samples were visually classified in the field with the percentage of rock recovered (REC) and the rock quality designation (RQD) determined.

The results of the visual analyses were utilized to prepare the attached Test Boring Logs which are presented in Appendix C of this report, along with a Glossary of Terms and Definitions. The approximate location of the test borings, along with other pertinent site information, is shown on the Boring Location Plan, in Appendix B.

LABORATORY TESTING

All recovered soil samples were retained by RVE for examination and testing. The field classifications were confirmed or modified as necessary by our Geotechnical Engineer. Gradation analysis and moisture content determinations were performed by TRC's testing laboratory on soil samples selected by RVE to determine soil properties and to assist in soil identification. Unconfined compression tests were also performed by TRC on two (2) representative rock core samples selected by RVE. Summaries of test results, along with graphic presentations of the test results are presented in Appendix E.

SUBSURFACE CONDITIONS

Published Geologic Data

Published geology indicates the soils at the site are unstratified glacial ground moraine deposited during the Wisconsin glaciation. These deposits are generally described as unassorted and heterogeneous with soil composition ranging from clay to gravel, cobbles and boulders, though silt and sand sizes are predominant. The colors vary from red to red-brown or brown.

Underlying the glacial deposits is soft red shale bedrock with occasional beds of red sandstone. The depth to bedrock in the region a generally variable, with depths usually greater than 10 feet. Shallower depths to bedrock often occur on the tops of existing ridges while greater depths are observed along the lower ridge slopes and in valleys.

The geologic information was obtained from the "Engineering Soil Survey of New Jersey," Rutgers University, Report Number 5, Union County, Engineering Research Bulletin Number 19, 1952.

Soils Encountered

The site soils are in general agreement with the published geologic data. Fill or possible fill soils were encountered beneath asphalt or concrete pavement in all borings. Underlying the fill layer, natural glacial deposits and decomposed bedrock was encountered until auger or sampling spoon refusal on shale bedrock. Weathered and decomposed rock fragments that are moderately friable were observed in the soil matrix of the glacial deposits. Beneath the fill soils and glacial deposits, shale bedrock was encountered and extended to the termination depth of the borings. A detailed description of the soils encountered is shown on the boring logs. A brief general description is

given in the following sections. Inferred Subsurface Cross Sections are presented in Appendix D. The cross-sections present interpolations between the borings and the actual subsurface conditions and elevations may vary from those shown on the sections.

Fill / Possible Fill Stratum (F/PF): Beneath a 6-inch layer of bituminous asphalt or concrete pavement, fill or possible fill was encountered to a depth of 6 to 13 feet below existing grade in all borings. The fill soils consist of coarse to fine reddish brown to gray sand with varying amounts silt, clay, crushed stone and rock asphalt fragments. The relative density of this stratum varies from loose to dense with normalized Standard Penetration Test (SPT) N_{60} and $N1_{60}$-values ranging from 4 to 49 blows per foot (bpf).

It should be noted, in the absence of foreign materials within the soil matrix, it may be difficult to differentiate between natural soils and fill or regraded soils, even when classified by experienced engineers. Accordingly, the depth of fill could vary from that indicated on the boring logs.

Glacial Moraine Deposits (GM): Underlying the fill stratum in all borings, naturally occurring glacial deposits were encountered to auger and sampling spoon refusal at depths ranging from 10 to 15 feet below existing grade. The soils in this stratum can be described as reddish brown coarse to fine sand with trace to "and" silt, trace to little clay and trace to some coarse to fine rock fragments. Immediately above the bedrock the soils become predominately coarse to fine rock fragments with little to some coarse to fine sand. The relative density of this stratum varies from compact to very dense, with normalized SPT $N1_{60}$-values ranging from 16 bpf to over 50 blows per foot. In general, the relative density of the stratum increases with depth, becoming very dense 1 to 2 feet above the bedrock.

Shale Bedrock (S): In all borings, shale bedrock was encountered below the glacial deposits. Rock coring of the bedrock was performed in all borings using a NX double tube core barrel, to the boring termination depths of 15 to 20 feet below existing grade. In borings B-1 through B-5, recoveries of 100% were observed, while recoveries of 95% and 42% were observed in borings B-6 and B-7 respectively. Rock quality designations ranged from 0% to 28%. The shale bedrock encountered in the rock cores was reddish brown, and is considered to be soft, moderately to highly weathered and extremely close to closely fractured.

Groundwater

Natural groundwater was not encountered in the borings at the time of drilling and prior to the introduction of water into the borehole for rock coring. However, pockets of shallow perched groundwater were observed in borings B-1 and B-4 at depths of 3.5 feet and 5 feet, respectively. It should be noted that this groundwater information represents the conditions encountered at the time of drilling operations. Groundwater levels generally can fluctuate due to changes in precipitation, infiltration, surface run-off and other hydrogeological factors. Therefore, the groundwater level present at the time of construction may vary from that observed at the time of the drilling operations.

It should also be noted that shallow or perched groundwater might be encountered during excavations for foundation construction, especially if the work commences after a wet weather period. Dewatering of perched water or surface runoff water encountered during construction can be performed using sump pumps.

DISCUSSION & RECOMMENDATIONS

The subsurface investigation indicated that the site is underlain by loose to medium-dense fill material and glacial deposits which is not suitable to support the proposed structure. Based on the results of our field investigation and laboratory test data, we have evaluated the existing subsurface soil and rock strata to determine their engineering properties and to recommend the most feasible foundation system, from a geotechnical engineering point of view, for the proposed parking garage structure. The natural intact bedrock is capable of supporting the proposed structure and the anticipated maximum design loads on a spread footing type foundation system.

Demolition, Site Preparation Procedures & Earthwork Operations

The proposed construction area is defined as the area within the proposed building limits, and a 5-foot wide zone outside the building.

1. Clear and strip from the construction area, any existing asphalt and concrete pavements or any other deleterious material. Also remove any structures, foundations, basement walls, floor slabs and all demolition debris completely from within the building footprint. Any debris, old foundations or abandoned pipes encountered during excavation, will have to be removed completely from the area under the proposed building to a minimum depth of 2 feet below the bottom slab elevation and completely from the area of the foundations. If any pipes are to be left in place, they must be completely filled with cement grout.

2. Excavate the site, where necessary as described in the "Soil Excavation" and/or "Rock Excavation" sections of this report, to proposed subgrade elevation. Over-excavate any unsuitable material or soils encountered below this elevation in the zone of influence of the foundations. The zone of influence is the volume of soil within lines drawn downward and outward, from the lower edges of a foundation, at a slope of 1.5H:1V. Unsuitable material includes all deleterious fill material, bricks, debris, rubble, or any other undesirable material designated by the on-site representative of the Geotechnical Engineer. Undesirable natural soils include all soft and loose soils encountered under the bottom of the foundation elevation. Replace the over-excavated material with controlled structural fill as defined herein.

3. After excavation procedures have been successfully completed, the rock surface should be examined and scaled to remove any loose rock fragments. The rock, including boulders or fingers and ledges of rock projecting into the bottom of excavation, should be removed to a minimum depth of 6 inches below the proposed bottom of foundation concrete. If the rock is shattered below the foundation elevation and surrounded by intact rock, the shattered material should be removed. The space created should be refilled with the same class of concrete as the overlying foundation. The rock surface should be freed from loose material, cleaned and cut to a firm surface, shaped and leveled according to final elevations. All seams should be cleaned out and filled with concrete, mortar or grout.

4. During a dry and favorable weather period and under the technical supervision of a representative of the Geotechnical Engineer, proof roll and compact the resulting subgrade, in areas underlain by soil, with a 10-ton heavy-duty vibratory roller. A minimum of 8 overlapping passes is recommended. Heavy equipment should not be

operated within 10 feet of any existing structures. Compaction of the soil in the vicinity of existing structures could be accomplished utilizing a mechanical compactor such as a walk behind vibratory roller or similar device as approved by the Geotechnical Engineer's representative on-site.

5. Undercut any zones of instability disclosed by the proof rolling, as determined by the on-site representative of the Geotechnical Engineer and replace the undercut material with controlled structural fill as defined herein. As required, raise the ground surface to proposed subgrade elevation with controlled structural fill. All material used as controlled structural fill material in the building area should comply with the requirements given herein and approved by the on-site representative of the Geotechnical Engineer.

6. All load-bearing fill should be controlled structural fill placed in loose horizontal lifts with a maximum thickness of 8 inches. Controlled structural fill should consist of inorganic, readily compactable, predominantly well-graded granular soils with no more than 12% fines (material passing the No. 200 sieve), and a maximum particle size of 3 inches. The moisture content of the fill materials should be controlled to within 2% of the optimum moisture content, as determined by ASTM D 1557, by wetting, aeration or blending, as necessary. It is recommended that controlled fill within the construction area be compacted to at least 98% and 95% of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557), below and above the footing subgrade elevations, respectively. In addition, it is recommended that all fills be stable without significant movement under construction traffic, as judged by the on-site representative of the Geotechnical Engineer. Quality control testing of in-place fill densities should be conducted throughout the entire earthwork operation.

7. In areas where the proposed foundations are lower than existing adjacent foundations, it will be necessary to protect the existing foundations from being undermined by appropriate sheeting and shoring or underpinning of the existing foundations. Conventional steel sheet piling, solder pile and lagging or pit underpinning will be satisfactory, but it should be designed by and installed in accordance with the requirements of a Licensed Professional Engineer.

Soil Excavation

It is recommended that open cut excavation be used in areas where the granular fill and the glacial deposits are encountered overlying the bedrock. Open excavations are feasible provided there is enough room so that the stability of existing structures is not affected. Existing structures may be considered not affected by the open cut excavation if a line projected downward from the bottom edge of the existing footings at a slope of 1.5H:1V does not intersect the excavation slope. Any section of the existing foundations affected by the excavation should be underpinned. We recommend that the depth of the foundation of the existing school building and other adjacent structures should be established before starting the excavation for the proposed addition. Temporary side slopes of open cut excavations should not be steeper than 2H:1V.

If any existing structures will be affected by an open cut excavation, we recommend that the affected structures be underpinned. Alternatively, temporary sheeting and shoring should be used to support the sides of the excavation. If temporary shoring is utilized, the soil parameters presented in the table below may be used for the design of the shoring. All excavations should be

in compliance with "Excavating and Trenching Operations" manual (latest revision), issued by the US Department of Labor, OSHA 2226 and local requirements.

Temporary Shoring Design Parameters

Stratum	Design Parameters	
Existing Fill: *From ground surface to Glacial Deposits or Rock*	Unit Weight of Soil (pcf)	115
	Angle of Internal Friction (ϕ)	28°
	Coefficient of Active Earth Pressure (K_a)	0.36
	Coefficient of Earth Pressure At-rest (K_o)	0.53
	Coefficient of Passive Earth Pressure (K_p)	2.7*
Glacial Deposits: *From bottom of fill to top of Rock*	Unit Weight of Soil (pcf)	120
	Angle of Internal Friction (ϕ)	30°
	Coefficient of Active Earth Pressure (K_a)	0.33
	Coefficient of Earth Pressure At-rest (K_o)	0.5
	Coefficient of Passive Earth Pressure (K_p)	3.0*

* A suitable factor of safety should be applied to K_p.

The lateral load information presented in this report should be used only as a guideline by the contractor, and it should be a requirement for the excavation contractor to prepare, and submit for review, a proposed sheeting and shoring design certified by a Licensed Professional Engineer prior to construction. The excavation contractor should be responsible for the design, installation, and maintenance of all sheeting and shoring.

Regardless of the excavation option chosen, excavated soils should not be stockpiled adjacent to the sides of the excavations to avoid the imposition of additional loads, unless these loads are considered in the design of the temporary shoring or side slopes. Additionally, the effect of excavation machinery should be included in the stability of the open cut slopes, as well as the temporary shoring design.

The on-site fill soils and glacial deposits are sensitive to moisture and are subject to disturbance and deterioration due to weather, moisture intrusion, construction traffic or any other site related disturbance. It is recommended that excavation equipment operating from the existing ground surface be utilized to complete the proposed excavations. The effect of this machinery should be included in the stability of the open cut slopes, as well as the temporary shoring design.

If soil subgrades within the excavation are to be left open for a prolonged period, a work mat should be used to protect the foundation subgrade. A work mat may consist of a layer of ¾ -inch quarry processed crushed stone, a two-inch lean concrete "mud mat," or other approved material, which will serve to level the footing subgrade, as well as to prevent subgrade softening if the subgrade is exposed for prolonged periods to surface water infiltration.

After the approval of excavation subgrade by a qualified on-site engineer, it is recommended that provisions be made to cover the bottom of the excavation with a 6-inch layer of ¾-inch clean

crushed stone or recycled concrete (minimum thickness), and to follow the recommendations given in the "Foundations" section of this report. This layer will provide a means of protecting the subgrade soil and will facilitate the construction procedures.

Rock Excavation

As discussed previously, the test borings indicate that the entire site is underlain by shale bedrock at a depth of 10 to 15 feet below existing grade. Based on the depth of the proposed basement it is expected that rock excavation may be required. The rock excavation will be facilitated in some areas by intense joints and fractures in the rock. In areas where highly fractured rock is encountered, it may possibly be rippable and can be excavated and removed using heavy construction equipment. Otherwise, in areas where the joints within the rock are more widely spaced, the rock can be dislodged and removed via pre-splitting using hydraulic rock splitters, pneumatic jack hammers or line drilling. Special provisions should be made during excavation. These are delineated in the following paragraphs.

Boulders extending laterally beyond the prescribed limits of excavation may be removed entirely. Any space created outside the prescribed limits due to the removal of such boulders should be refilled with controlled structural fill material as specified in this report.

If the rock excavation extends beyond the bottom elevation of the footing the space created between the intact rock and footing bottom should be refilled with the same class of concrete as the overlying foundation.

After completing the excavation of each section of rock and before beginning the next section, the rock vertical face or sloped surface of the excavation, should be scaled to remove any loose unstable rock fragments. The on-site engineer and the contractor should both examine all rock slopes during the excavation to identify possible unstable conditions and to determine the need for stabilization.

Care should be taken not to leave undrained pockets of surface water on the surface of the rock. Dewatering of surface runoff water encountered during construction can be performed using sump pumps.

Backfill

A portion of the on-site soils contain fine grained material and are sensitive to moisture which may make them difficult to compact. Therefore, these soils are not suitable for use as controlled structural fill. However, they can be used as non-structural fill to raise grades outside of the building envelope and in any paved areas provided, they can be placed at a moisture content which would permit compaction to the required densities. The clean granular portions of the existing on-site soils can be reused as backfill after approval by the Geotechnical Engineer. Soils with organic or other deleterious materials should be discarded. The moisture content of the soil must be within 2% of the optimum value for proper compaction. Therefore, some adjustment of the moisture content may be necessary prior to use as fill material. If imported fill materials are required to complete backfilling of the excavations, they should consist of uncontaminated, relatively well-graded granular soils as defined in Item 5 of the Demolition, Site Preparation Procedures & Earthwork Operations portion of this report.

Backfilling against the foundations and for utility trenches, or other structural uses, should be accomplished using controlled structural fill, as defined in this report, compacted to 95% of the maximum dry density as determined by the Modified Proctor Test, ASTM D 1557. Compaction of the backfill within 5 feet of any existing structures should be perfomed with relatively light equipment such as a jumping jack, a walk behind roller, or similar device as approved by the on-site representative of the Geotechnical Engineer. The backfill should be placed in 8-inch lifts and compacted to at least 95% and 90% of maximum dry density, as determined by the ASTM D-1557 test procedure, in structural and paved areas or landscaped areas, respectively.

Dewatering

The results obtained at the time of the drilling operation indicate that no natural groundwater was encountered in the borings and therefore continuous dewatering operations should not be required on this site. However, shallow perched groundwater was encountered in two (2) borings at the time of our drilling operation. The removal of perched water, run-off water and any water accumulating in pockets in the surface of the subgrades and exposed rock should be removed. This could be accomplished using sump pumps.

Foundations

The existing fill or glacial deposits are not suitable for direct support of the anticipated heavy column and wall loads of the proposed structure. Based on the results of our field and laboratory investigations and on our engineering analyses, conventional spread footings founded on intact rock, will be the most suitable foundation system for the proposed parking garage structure. For design purposes, a maximum net allowable bearing pressure of 8 tons per square foot (tsf) can be used for both the column and continuous wall foundations. Bearing elevations between boring locations will vary depending upon the exposed soil and rock elevations. With the use of the recommended allowable bearing capacities, a satisfactory factor of safety will be provided against a shear failure and total and differential settlement will be within tolerable limits. The liquefaction potential of the subsoils was also evaluated, and the subsoils were found to have a very low liquefaction potential.

Wall and column footing widths should not be less than 2 and 3 feet respectively. All continuous wall footings should be designed to project at least six inches on each side of the walls. The requirements that the footings be founded at least three (3) feet beneath the finish grade level for frost protection will necessarily be satisfied with the foundations bearing on bedrock. In the vicinity of the existing structures, the proposed foundation bottom elevation should be the same as that of the existing foundation. It should be pointed out that in no case should a line drawn downward at a 1.5H:1V slope from the nearest edges of the proposed foundation bottom elevation intersect with any existing foundations, and vise versa. If the adjacent building foundation is above the proposed new footing founding level, their foundations must be underpinned to prevent undermining the existing foundations or structures.

Footing subgrades on rock should be level and prepared as discussed in Item 3 of the Demolition, Site Preparation Procedures & Earthwork Operations portion of this report. The footing subgrades on compacted structural fill should be thoroughly compacted prior to the placement of the concrete utilizing a mechanical compactor such as a jumping jack, walk-behind roller, or similar device as approved by the on-site representative of the Geotechnical Engineer.

Prior to the placement of concrete, the foundation subgrade must be inspected by a qualified representative of the Geotechnical Engineer in order to confirm that the rock subgrade is properly prepared and that the soil bearing capacity of any compacted structural fill is satisfactory. The contractor should exercise extreme caution not to disturb the subgrade soils. Should the subgrade be disturbed, the loosened soil should be compacted in-place or excavated down to firm soil. Any water, which accumulates in the bottom of the foundation excavation, should be removed promptly.

Basement Construction

The basement walls should be designed to resist the expected lateral soil pressure and any surcharge load located within 15 feet of the basement wall. For design purposes, the lateral earth pressure may be estimated using the following recommended parameters:

Unit Weight of Soil (pcf)	120
Angle of Internal Friction (ϕ)	30^o
Coefficient of Active Earth Pressure (K_a)	0.33
Coefficient of Earth Pressure At-rest (K_o)	0.5
Coefficient of Passive Earth Pressure (K_p)	3.0*

* A suitable factor of safety should be applied to K_p.

We recommend that the at-rest (K_o) earth pressure coefficient should be used in the design of basement walls. All anticipated surface surcharge loads should also be taken into consideration.

Natural groundwater was not encountered in the borings, however shallow perched groundwater was encountered in borings B-1 and B-4. Based on the observed perched groundwater and the stratification and visible soil drainage characteristics of soils encountered during the geotechnical investigation, the likelihood of perched water tables and isolated zones of saturation can exist within the soil strata. We therefore recommend that a perimeter drainage system be installed to remove any groundwater seepage that may accumulate adjacent to the basement wall. The perimeter drainage system should include perimeter drains and free draining backfill, or a perimeter drainage membrane placed against the exterior basement walls. The perimeter drain should consist of perforated pipe (ADS or equivalent), having a minimum diameter of 4 inches. The pipe should be surrounded with 6 inches of clean ¾-inch crushed stone or washed gravel on all sides. The gravel should be wrapped in filter fabric (Mirafi 140N, or equivalent). The perimeter drainage system should flow by gravity into a nearby storm water system, if feasible, or connected to a sump from which water may be pumped. The exterior basement walls should be damp proofed and, if free-draining backfill is not installed, the walls should be provided with a drainage membrane, such as Tuff-N-Dri, Amerdrain or Miradrain or equal. The membrane should be hydraulically connected to the foundation drain and should extend to within 2 feet of the finished ground surface. After installation of the perimeter drainage system, the basement can be backfilled using approved imported select fill.

In addition, to the recommended subsurface drainage system, it is recommended that the finish exterior grades around the proposed building addition be sloped away from the building walls to rapidly drain the surface run-off water away from the building perimeter.

Slabs on Grade

Proposed reinforced concrete slabs on grade can be uniformly supported on the densified natural soil or controlled structural fill after site preparation procedures have been successfully completed as discussed herein. The slabs should be structurally independent of walls and footings. Large floor areas should be provided with joints at frequent intervals as determined by the structural engineer. A minimum of 4 inches of ¾-inch clean crushed stone or a 12-inch thick layer (minimum) of well-graded sand and gravel with not more than 5% non-plastic fines is recommended below the slab to assure uniform bearing conditions and to act as a capillary break. A vapor barrier should be placed between the slab and base course, as directed by the Architect, to minimize moisture migration to the surface. All structural fill supporting the floor slab should be compacted to 95% of the maximum dry density (ASTM D 1557).

Concrete slabs placed on the subgrade, prepared as described herein, can be designed using a modulus of subgrade reaction of 225 pounds per cubic inch (pci).

Seismic Zone

According to the New Jersey Edition of the 2018 International Building Code, Section 1613.2.2 referencing ASCE 7, Chapter 20 the project site is categorized as a Site Class "C" for seismic design purposes. This classification is based on subsoil conditions encountered in the borings. In general, the density of the soil below the test borings should increase with depth, based on experience.

LIMITATIONS

The conclusions and recommendations contained in this report are based upon the subsurface data obtained during this investigation and on details stated in this report. It is understood that the number of borings made are consistent with good engineering practice but actual conditions encountered may differ significantly from those projected in this report. Should conditions arise which differ from those described in this report, **RVE** should be notified immediately and provided with all information regarding differing subsurface conditions.

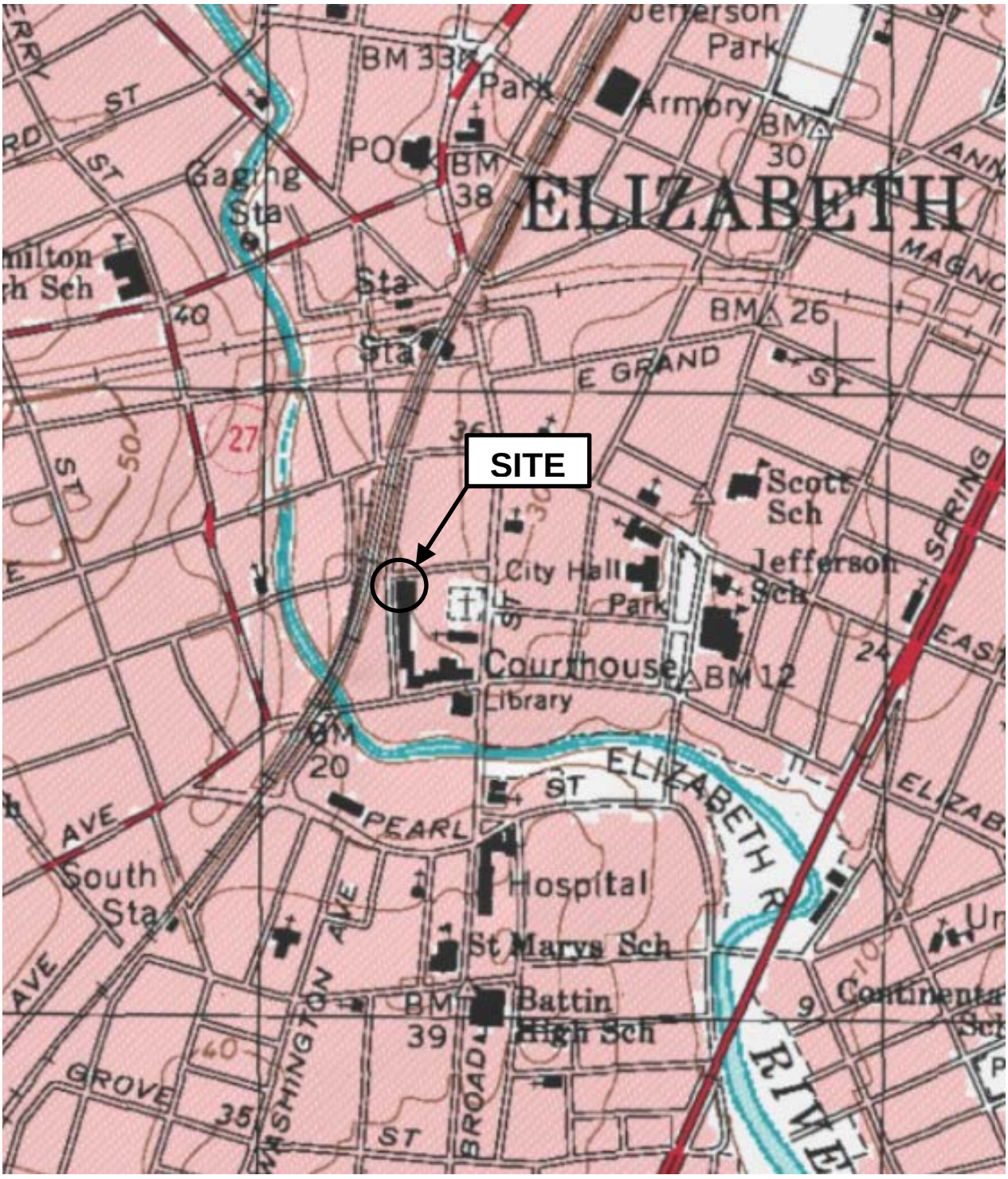
Our recommendations are based upon the assumption that the services of a qualified Geotechnical Engineer will be retained during construction for the observation of all critical earthwork operations and foundation installation. **RVE** cannot minimize, or provide recommended solutions for, any problems resulting from construction or differing soil conditions unless our services include full-time construction inspection to determine that the work performed is in compliance with **RVE's** recommendations, and to ensure the work is carried out in the owner's best interests.

Environmental considerations and contaminants, such as petroleum products, hazardous waste, radioactivity, irritants, pollutants, radon or other dangerous substances and conditions were not the subject of this study. Their presence and/or absence are not implied, inferred or suggested by this report or results of this study.

This report is intended for use with regard to the specific project discussed herein, and any changes in the design of the structure or location, however slight, should be brought to our attention so that we may determine how they may affect our conclusions. We are responsible for the conclusions and opinions contained in this report based on the data relating only to the specific project and location discussed herein.

Appendix A

Site Location Map/USGS Quadrangle



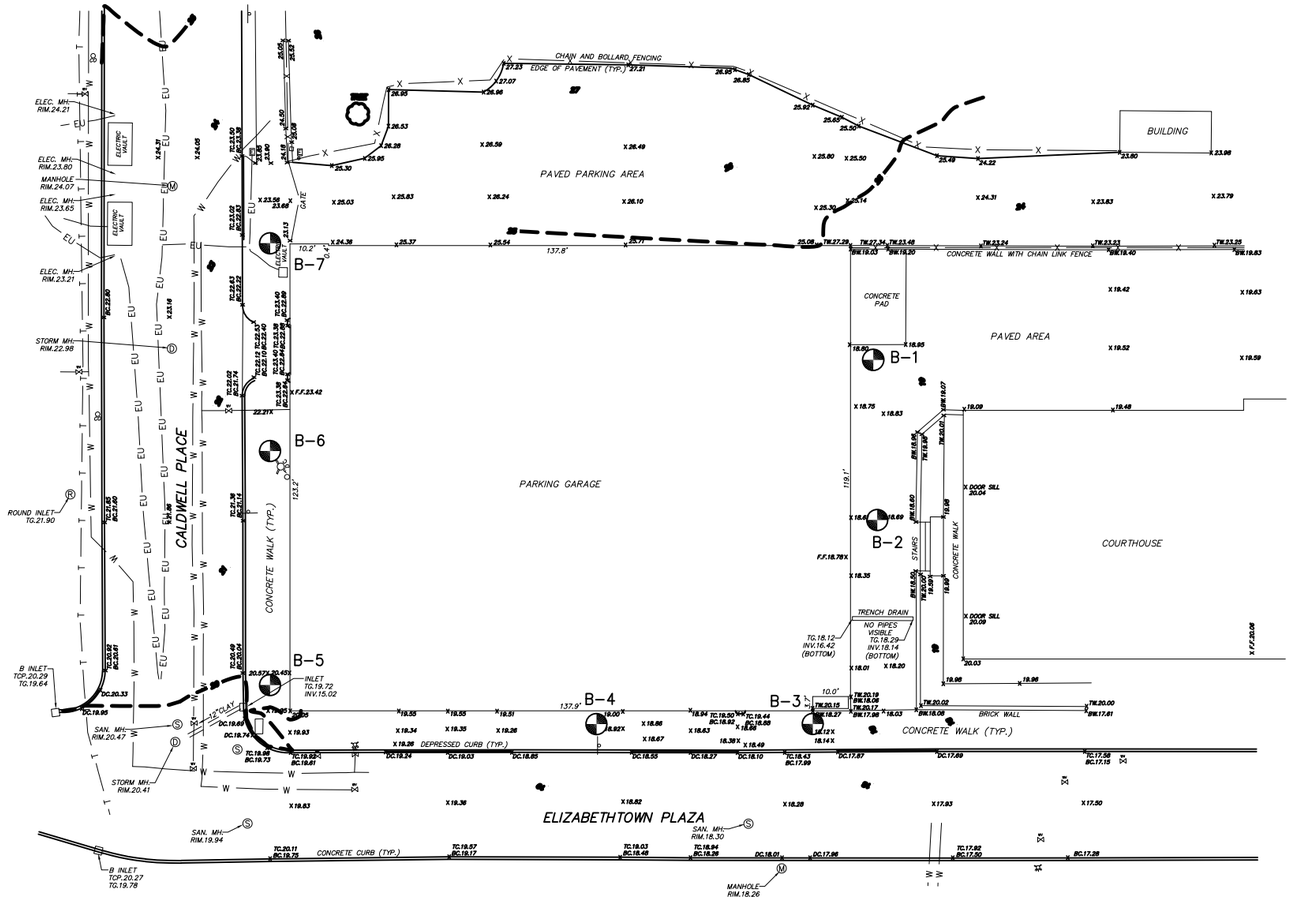
Site Location Map/USGS Quadrangle

Proposed New Union County Parking Garage Structure

Elizabeth, Union County, New Jersey

Appendix B

Soil Boring Location Plan



PLAN

SCALE: 1"= 40'

N.J.S.P.C.S. NAD 1983

GRAPHIC SCALE

40 0 20 40

(IN FEET)

1 inch = 40 ft.

LEGEND

B-1 DENOTES NUMBER AND APPROXIMATE LOCATION OF TEST BORINGS

NO.	REVISION	DATE	BY	CHK. BY

BORING LOCATION PLAN

CALDWELL & ELIZABETHROWN PARKING GARAGE

CITY OF ELIZABETH, UNION COUNTY, NEW JERSEY

RVE 1901

REMINGTON & VERNICK ENGINEERS GA 277045

232 KING'S HIGHWAY EAST HADDONFIELD, NJ 08033

(856) 795-9595, FAX (856) 795-1882, WEB SITE ADDRESS: WWW.RVE.COM

SCALE	DATE	DRAWN BY	DSGN. BY	CHK'D. BY	DWG. NO.	SHEET NO.
1"=40'	10/2020	C.O.G.	K.C.W.	K.C.W.		1 OF 1

DWG FILE PATH/NAME

Appendix C

Soil Boring Logs

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-1

Date Started: 10/27/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/27/20 **Client** Union County **Surface Elev.** 18.79 +/-

Drilling Contractor: Sano Drilling Inc **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/27/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Chris Gilbert **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Asphalt and Subbase			
		S-1	15-11-16	6"		Reddish brown c-f SAND, some c-f Rock Fragments, trace Silt (Fill)			
		S-2	6-3-3-2	16"		Reddish brown m-f SAND, little Silt little c-f Crushed Stone, trace Clay Perched water at 3.5 Feet (Fill)			
5		S-3	3-2-2-3	6"					
		S-4	14-23-35-50/4"	20"		Reddish brown c-f SAND, some m-f Rock Fragments, trace Silt, trace Clay			
		S-5	50/5"			Reddish brown c-f ROCK FRAGMENTS, little f Sand, trace Silt			
			AUGER						
10		C-1	ROCK CORE	60"		Reddish brown RED SHALE,soft, moderately to highly weathered and extremely close to closely fractured REC=100% RQD=25%			
15						Boring End at 15 Feet boring end			
20									
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-2

Date Started: 10/27/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/27/20 **Client** Union County **Surface Elev.** 18.65 +/-

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/27/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Chris Gilbert **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Asphalt and Subbase			
		S-1	26-21-19	10"		Dark brown m-f SAND, some Asphalt Fragments, trace Silt (Fill)			
		S-2	11-8-5-9	12"		Reddish brown c-f SAND, some m-f Rock Fragments, trace Silt, trace Clay (Possible FIll)			
5		S-3	5-3-4-2	14"					
		S-4	5-4-8-10	10"					
		S-5	22-41-39-50/ 4"	20"		Reddish brown c-f ROCK FRAGMENTS, some c-f Sand, trace Silt, trace Clay			
10		C-1	ROCK CORE	60"		Reddish brown RED SHALE,soft, moderately to highly weathered and extremely close to closely fractured REC=100% RQD=25%			
15						Boring End at 15 Feet boring end			
20									
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-3

Date Started: 10/28/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/28/20 **Client** Union County **Surface Elev.** 18.12 +-/

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/28/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Chris Gilbert **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Concrete Sidewalk			
		S-1	3-2-2	4"		Brown m-f SAND, some c-f Crushed Stone, trace Silt (Fill)			
		S-2	3-2-4-2	12"		Reddish brown c-f SAND, little m-f Crushed Stone, little Silt (Fill)			
5		S-3	3-2-1-1	10"					
		S-4	2-1-2-2	6"					
		S-5	29-22-5-5	4"					
10									
		S-6	3-50/3"	6"		Reddish brown ROCK FRAGMENTS, little c f Sand, trace Silt			
15		C-1	ROCK CORE	60"		Reddish brown RED SHALE, soft, moderately to highly weathered and extremely close to closely fractured REC=100% RQD=28%			
20						Boring End at 19 Feet boring end			
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-4

Date Started: 10/28/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/28/20 **Client** Union County **Surface Elev.** 18.93 +/-

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/28/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Chris Gilbert **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Concrete Sidewalk			
		S-1	2-2-5	10"		Reddish brown SILT, little f Sand, trace Clay (Possible Fill)			
		S-2	7-9-9-10	10"		Reddish brown c-f SAND, little Silt, trace Clay (Possible FIll)			
5		S-3	4-4-3-4	12"		Reddish brown c-f SAND, little Clayey Silt. Perched water at 5 feet (Possible Fill)			
		S-4	5-4-6-7	12"		Reddish brown c-f SAND, little Clayey Silt, little m-f Rock Fragments.			
		S-5	8-11-20-22	20"		Reddish brown c-f SAND, some m-f Rock Fragments, some Silt, trace Clay			
10									
		S-6	50/1"	NR					
			AUGER						
15		C-1	ROCK CORE			Reddish brown RED SHALE, soft, moderately to highly weathered and extremely close to closely fractured REC=100% RQD=12%			
20						Boring End at 20 Feet boring end			
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-5

Date Started: 10/28/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/28/20 **Client** Union County **Surface Elev.** 20.40 +/-

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/28/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Chris Gilbert **Time**

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Concrete Sidewalk			
		S-1	4-3-3	6"		Reddish brown m-f SAND, little Silt, little m-f Crushed Stone (Fill)			
		S-2	3-3-5-5	12"		Reddish brown m-f SAND, little Silt, trace Clay, trace f Crushed Stone (Fill)			
5		S-3	5-5-6-10	12"		Reddish brown m-f SAND, little Silt, trace Clay, little m-f Crushed Stone (Fill)			
		S-4	12-8-4-5	16"		Reddish brown SAND & SILT, little m-f Rock Fragments,trace Clay			
		S-5	5-5-5-8	18"					
10									
		S-6	16-50/4"	10"		Reddish brown m-f ROCK FRAGMENTS, some c-f Sand, little Silt			
			AUGER						
15		C-1	ROCK CORE	60"		Reddish brown RED SHALE, soft, moderately to highly weathered and extremely close to closely fractured REC=100% RQD=18%			
20						Boring End at 20 Feet boring end			
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-6

Date Started: 10/29/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/29/20 **Client** Union County **Surface Elev.** 21.90 +/-

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/29/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Eric Runstrom **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Concrete Sidewalk			
		S-1	8-8-6	18"		Grayish brown c-f SAND, some m-f Crushed Stone, trace Silt (Fill)			
		S-2	8-7-6-7	18"		Reddish brown c-f SAND, trace Silt (Possible Fill)			
5		S-3	3-4-4-5	16"					
		S-4	6-6-7-8	15"					
		S-5	7-7-7-7	10"		Reddish brown c-f SAND, trace m-f Rock Fragments, trace Silt			
10									
		S-6	20-24-50/4"	14"		Reddish brown m-f ROCK FRAGMENTS, some c-f Sand, trace Silt			
			AUGER						
15		C-1	ROCK CORE	57"		Reddish brown RED SHALE, soft, moderately to highly weathered and extremely close to closely fractured REC=95% RQD=28%			
20						Boring End at 19 Feet boring end			
25									
30									
35									

REMINGTON & VERNICK ENGINEERS

SOIL BORING LOG

Project No. 2000F020 **Project** Caldwell & Elizabethtown Parking Garage **Boring No.** B-7

Date Started: 10/29/20 **Location** Elizabethtown Plaza, Elizabeth, Union County, NJ **Sheet** 1 **of** 1

Date Finished: 10/29/20 **Client** Union County **Surface Elev.** 23.20 +/-

Drilling Contractor: Sano Drilling Inc. **Groundwater Data**

Drilling Method: Hollow Stem Augers & NX Core Barrel **Depth** None

Hammer Type: Automatic **Driller:** Shaun Ward **Date** 10/29/20

Equipment: Diedrich D-50 Tracked Rig **Inspector:** Eric Rundstrom **Time** During

Depth (ft.)	Sample Type	Sample Number	Blow Count (Blows per 6 inches)	Recovery	Lithology	Classification of Materials (Based upon samples recovered and observation of materials returned between samples)	Stratum	Moisture Content, %	Other Tests
0						6" Concrete Sidewalk			
		S-1	3-2-2-2	3"		Brown m-f CRUSHED STONE (Fill)			
		S-2	2-3-3-5	12"		Reddish brown c-f SAND, some m-f Crushed Stone, trace Silt (FIll)			
5		S-3	5-6-6-7	12"		Reddish brown c-f SAND, little SIlt, trace f Crushed Stone (FIll)			
		S-4	7-8-12-15	8"		Reddish brown c-f SAND, little Silt, trace Clay			
		S-5	15-15-17-19	10"		Reddish brown c-f SAND, some f Rock Fragments, trace Silt			
10									
		S-6	17-7-50/3"	10"					
			AUGER						
15		C-1	ROCK CORE	25"		Reddish brown RED SHALE, soft, moderately to highly weathered and extremely close to closely fractured REC=42% RQD=0%			
20						Boring End at 19.25 Feet boring end			
25									
30									
35									

KEY TO SYMBOLS

Symbol Description

Strata symbols

Paving

Fill

Glacial Deposit

Shale

Soil Samplers

Standard penetration test

Auger

Rock core

Notes:

1. **Exploratory borings were drilled on 10/27/20 through 10/29/20 using a continuous flight hollow stem augers. Rock coring was perfromed using a NX size double tube core barrel.**
2. **Natural groundwater was not encountered at the time of drilling and prior to the introduction of water for the rock coring operation.**
3. **Boring locations were located from existing features and elevations extrapolated from the topographic survey plan prepared by PS&S, dated 10/12/20.**
4. **These logs are subject to the limitations, conclusions, and recommendations in this report.**

MODIFIED METHOD
FOR
IDENTIFICATION OF SOILS
AFTER
DR. D. M. BURMISTER

Soil Component	Descriptive Terms As Written on Log	Range of Proportions
PRINCIPAL COMPONENT (All Letters Capitalized)	-	35% or more
MINOR COMPONENTS (First Letter Capitalized)	and (a.)	35% to 50%
	some (s.)	20% to 35%
	little (l.)	10% to 20%
	trace (tr.)	1% to 10%

Coarse Grained Soils-Gradation of Components

Coarse to fine	cf	All sizes
Coarse to medium	cm	Less than 10% fine
Medium to fine	mf	Less than 10% coarse
Coarse	c	Less than 10% medium & fine
Medium	m	Less than 10% coarse & fine
Fine	f	Less than 10% coarse & medium

Component	Symbol	Sieve Range
Boulders		9” and larger
Cobbles		3” to 9”
Gravel	G	
Coarse		¾” to 3”
Fine		#4 to ¾”
Sand	S	
Coarse		#4 to #10
Medium		#10 to #40
Fine		#40 to #200

Fine Grained Soils-Plasticity of Components

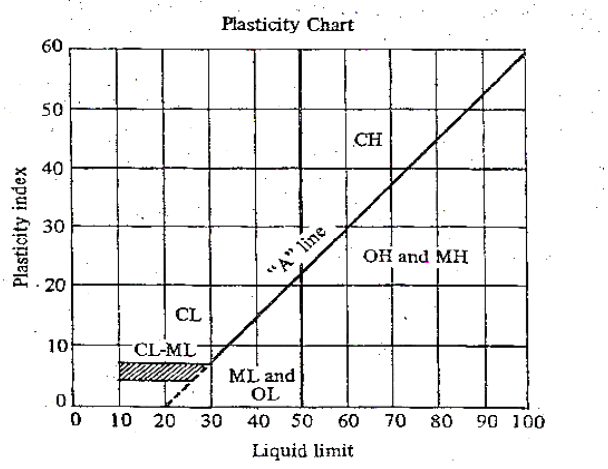
Component	Symbol	Overall Plasticity	Plasticity Index
SILT	S	Non-Plastic	0
CLAYEY SILT	CyS	Slight	1 to 5
SILT & CLAY	S & C	Low	5 to 10
CLAY & SILT	C & S	Medium	10 to 20
SILTY CLAY	SyC	High	20 to 40
CLAY	C	Very High	over 40

UNIFIED SOIL CLASSIFICATION SYSTEM. (ASTM D-2487)

Major Divisions			*Group Symbols*		*Typical Names*	*Laboratory Classification Criteria*	
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mix-tures, little or no fines	Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. Less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u		Atterberg limits below "A" line with P.I. Greater than 7	
			GC		Clayey gravels, gravel-sand-clay mix-tures		
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-silt mixtures	Atterberg limits above "A" line or P.I. Less than 4	Limits plotting in hatched zone with P.I. Between 4 and 7 are *borderline* cases requiring use of dual symbols
				u		Atterberg limits above "A" line with P.I. Greater than 7	
			SC		Clayey sands, sand-clay mixtures		
Fine-grained soils (More than half material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)	ML			Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
		CL			Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		OL			Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)	MH			Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
		CH			Inorganic clays of high plasticity, fat clays		
		OH			Organic clays of medium to high plasticity, organic silts		
	Highly organic soils	Pt			Peat and other highly organic soils		

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

	Borderline cases requiring dual symbols[b]
Less than 5 per cent	GW, GP, SW, SP
More than 12 per cent	GM, GC, SM, SC
5 to 12 per cent	

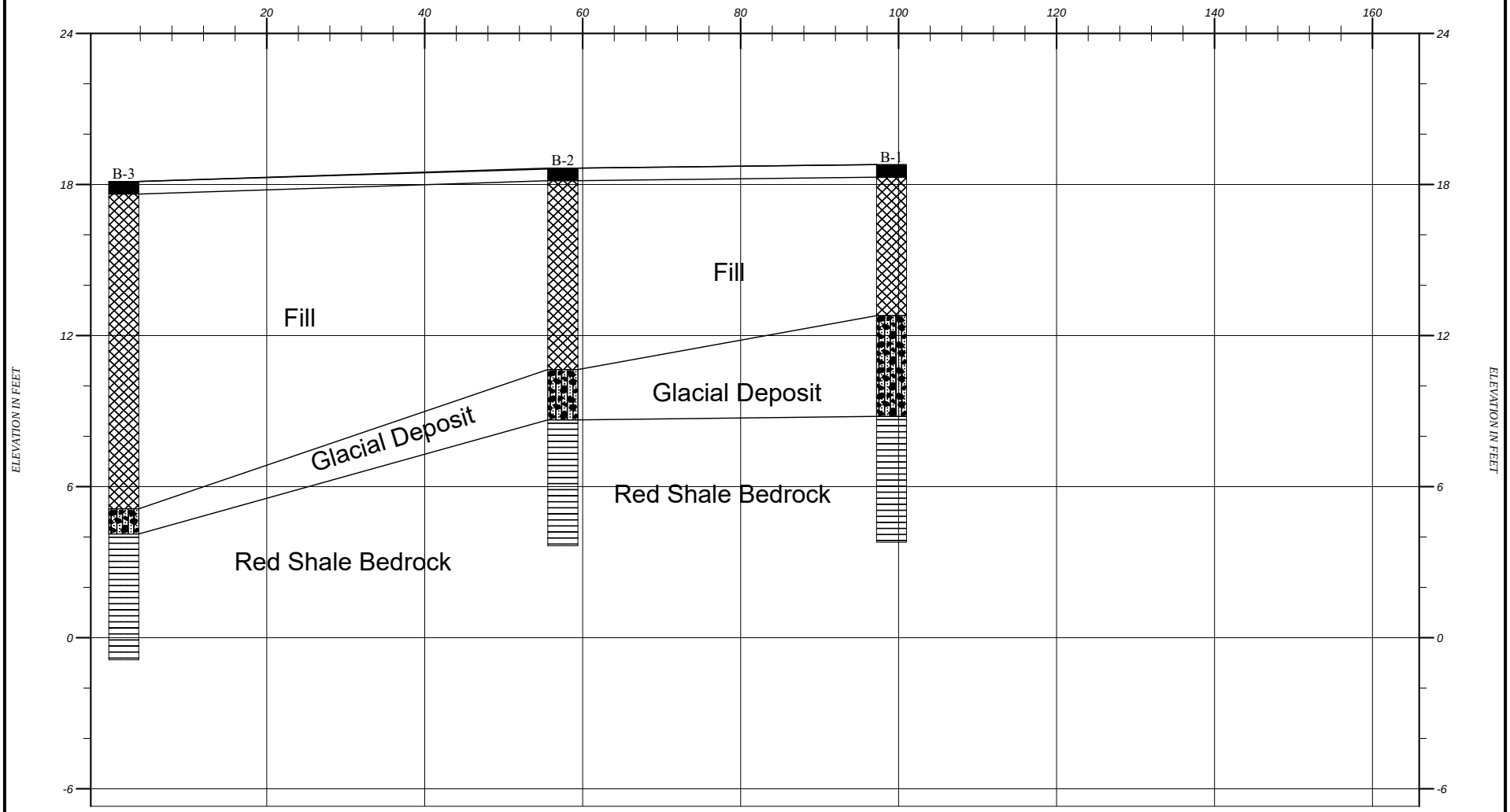


[a]Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. Is 6 or less; the suffix u used when L.L. is greater than 28.

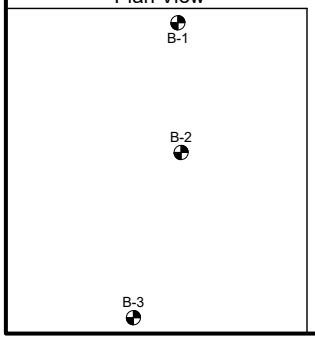
[b]Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

Appendix D

Subsurface Cross Sections



Plan View



Strata symbols

- Paving
- Fill
- Glacial Deposit
- Shale

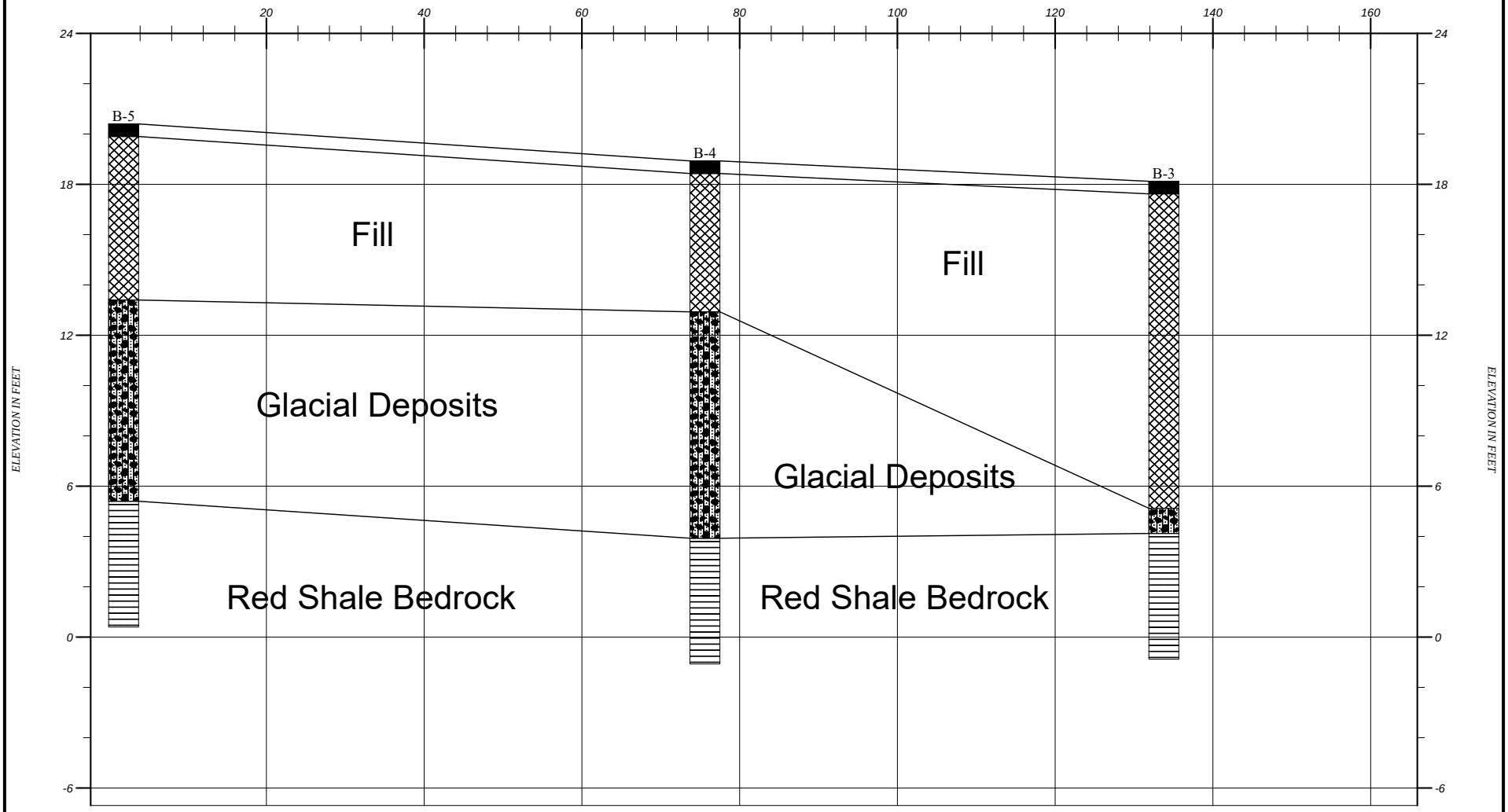
Remington & Vernick Engineers

GENERALIZED SOIL PROFILE

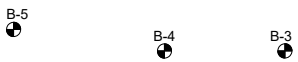
HORIZONTAL SCALE: 1"=20' / VERTICAL SCALE: 1"=6'	DRAWN BY/APPROVED BY	DATE DRAWN
		12/11/2020

Caldwell & Elizabethtown Parking Garage

PROJECT NO. 2000F020	FIGURE NUMBER 1



Plan View



Strata symbols

- Paving
- Fill
- Glacial Deposits
- Shale

Remington & Vernick Engineers

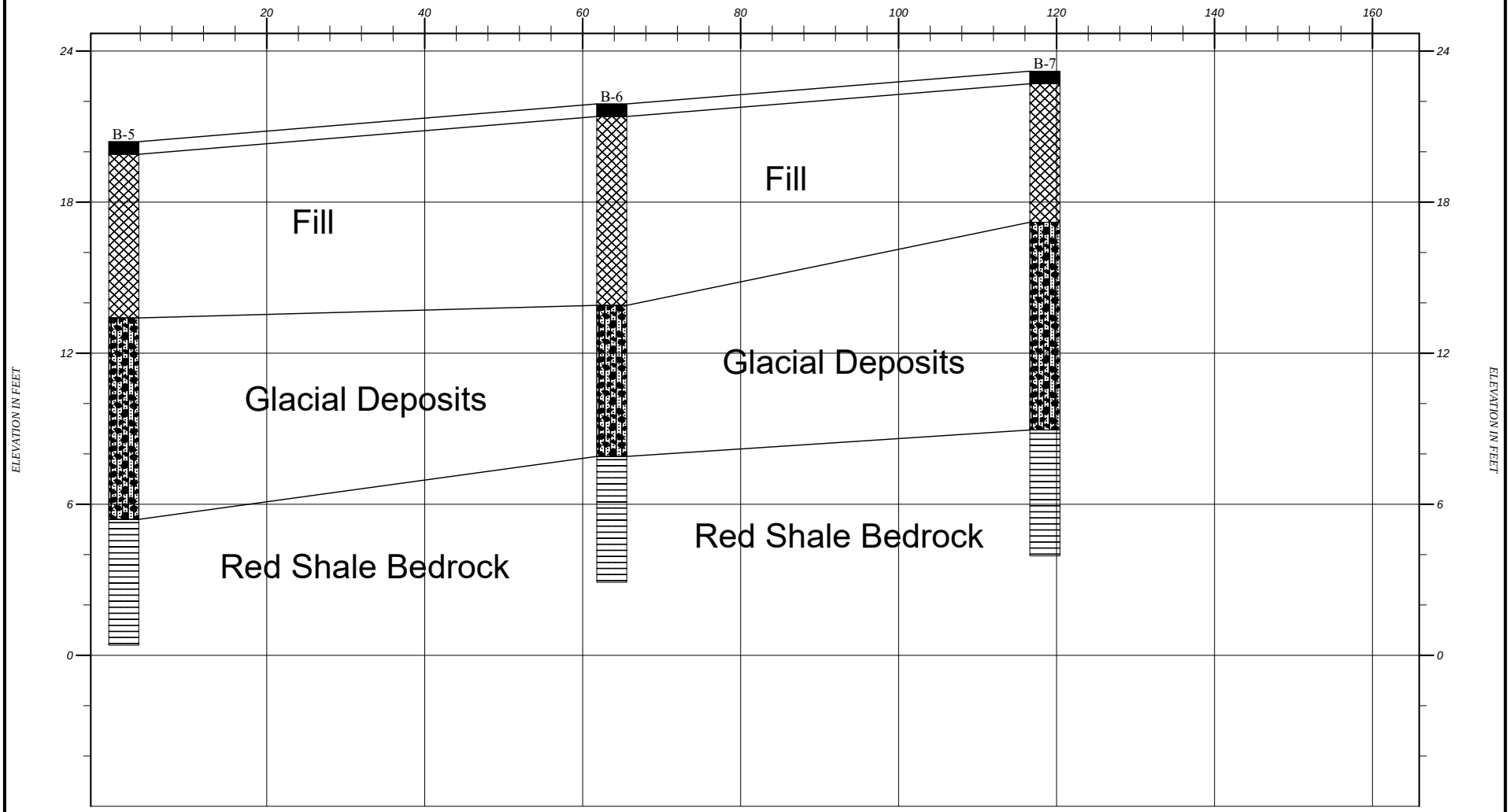
GENERALIZED SOIL PROFILE

HORIZONTAL SCALE: 1"=20'	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE: 1"=6'		12/11/2020

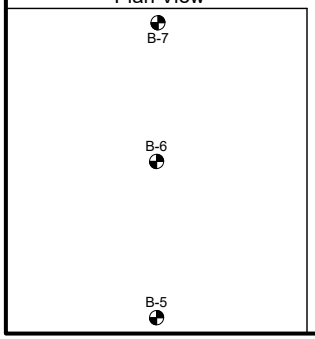
Caldwell & Elizabethtown Parking Garage

PROJECT NO. 2000F020

FIGURE NUMBER 2



Plan View



Strata symbols

- Paving
- Fill
- Glacial Deposits
- Shale

Remington & Vernick Engineers

GENERALIZED SOIL PROFILE

HORIZONTAL SCALE: 1"=20'	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE: 1"=6'		12/11/2020

Caldwell & Elizabethtown Parking Garage

PROJECT NO. 2000F020	FIGURE NUMBER 3

Appendix E

Soil Lab Test Results

SUMMARY OF LABORATORY TEST DATA

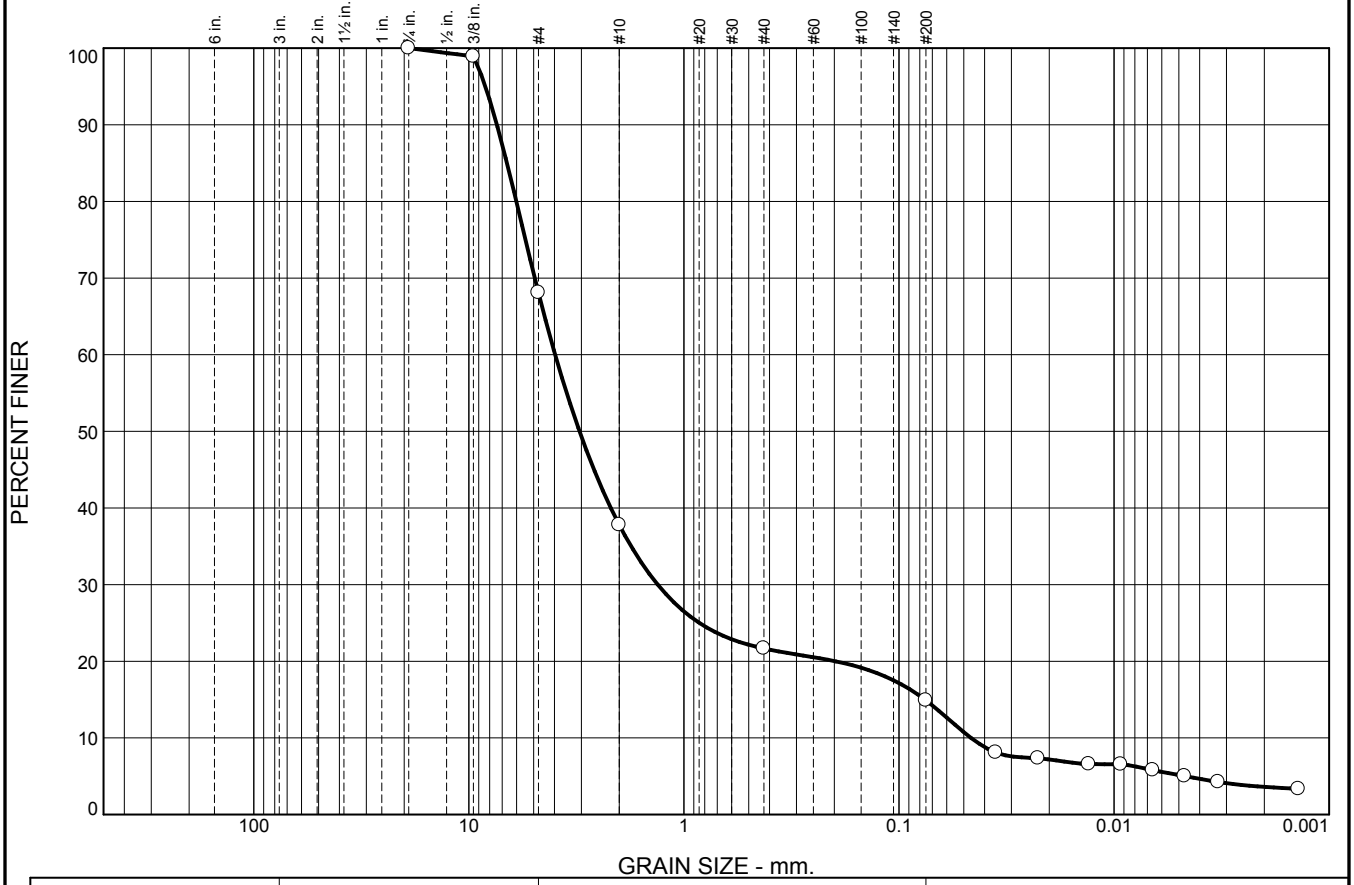
Project Name: Caldwell Elizabethtown Parking Deck
Client Name: Remington & Vernicks Engineers
TRC Project #: 422671

SAMPLE IDENTIFICATION			ASTM Soil Group	Moisture Content (%)	GRAIN SIZE DISTRIBUTION				Dry Unit Weight (PCF)	Unconfined Compressive Strength (TSF)
Boring #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
B-1	S-4	6.0-8.0	SM	7.4	31.9	53.2	9.7	5.2	-	-
B-2	S-4	6.0-8.0	SM	8.3	22.4	59.4	11.0	7.2	-	-
B-4	S-4 & S-5	6.0-10.0	SM	12.5	16.5	40.8	26.4	16.3	-	-
B-4	C-1	10.0-15.0	-	-	-	-	-	-	158.8	819
B-5	S-4	6.0-8.0	SM	14.2	15.1	43.3	24.4	17.2	-	-
B-5	S-5	8.0-10.0	SM	11.8	21.1	31.1	32.3	15.5	-	-
B-6	S-5	8.0-10.0	SC-SM	7.2	7.7	79.0	5.8	7.5	-	-
B-6	C-1	13.0-18.0	-	-	-	-	-	-	160.9	443
B-7	S-4 & S-5	6.0-10.0	SC-SM	12.6	11.0	65.0	13.7	10.3	-	-

DRAWN BY: TBT 12/08/20

CHECKED BY: JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	31.9	30.3	16.1	6.8	9.7	5.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.6517	3.9708	3.0581	1.3240	0.0758	0.0462	9.55	85.92

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY SAND WITH GRAVEL	12/08/20	SM	7.4

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-1 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

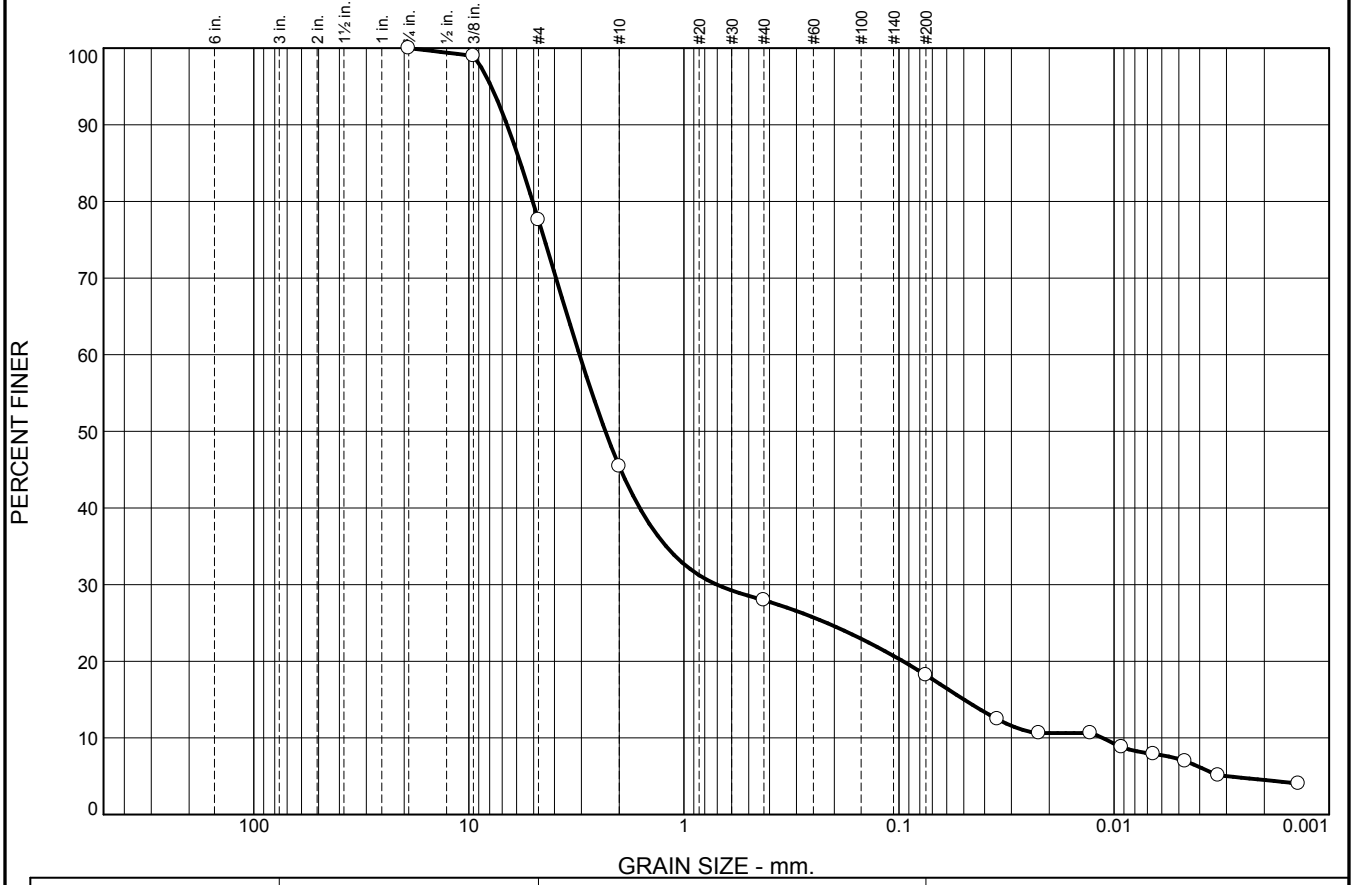
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 1

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	22.4	32.1	17.5	9.8	11.0	7.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			5.7583	3.0588	2.3185	0.7033	0.0499	0.0113	14.30	270.51

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY SAND WITH GRAVEL	12/08/20	SM	8.3

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-2 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

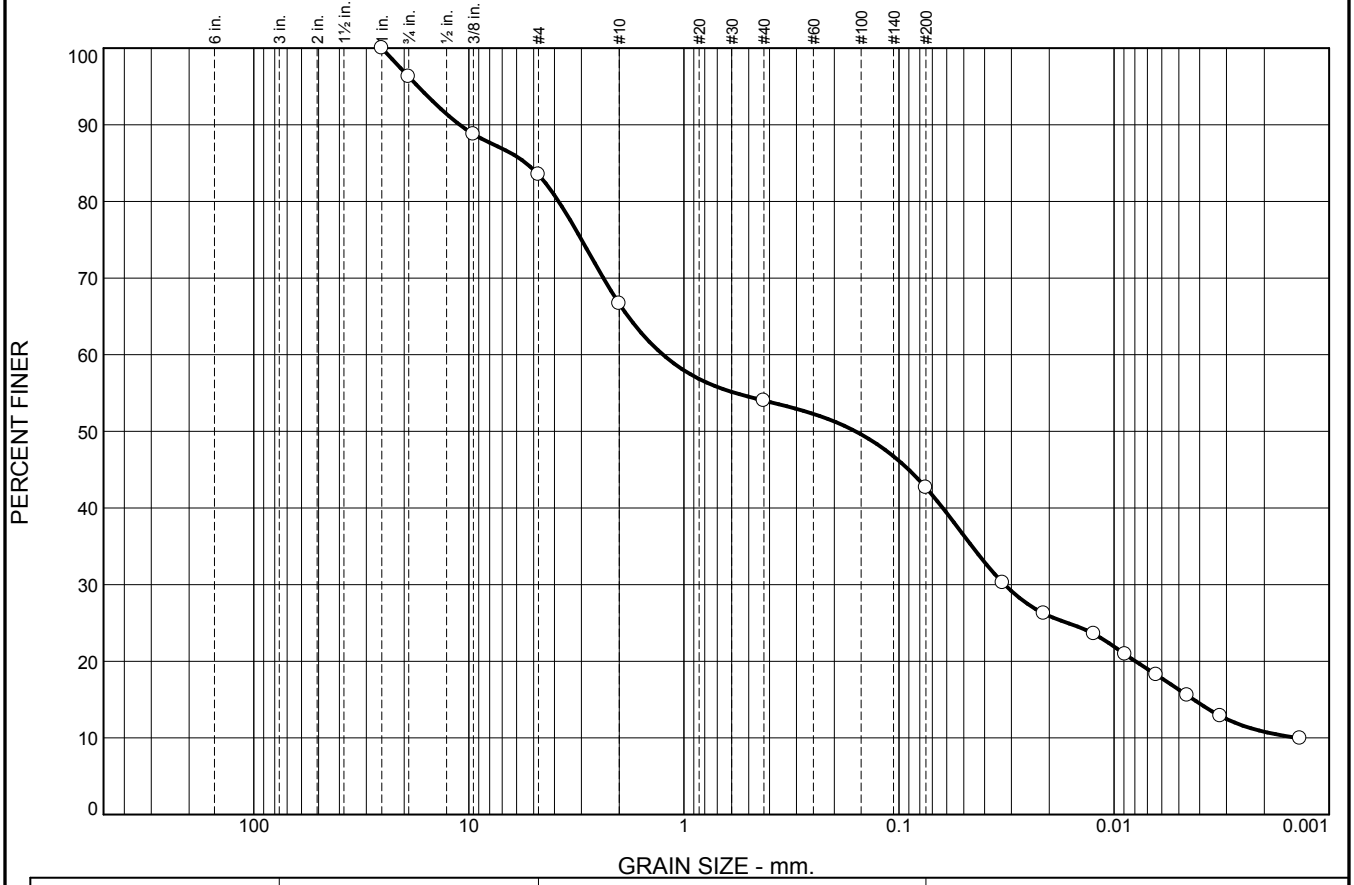
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 2

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.7	12.8	16.8	12.7	11.3	26.4	16.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			5.4262	1.2513	0.1592	0.0323	0.0043	0.0014	0.59	887.49

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY SAND WITH GRAVEL	12/08/20	SM	12.5

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-4 **Depth:** 6.0-10.0 FT **Sample Number:** S-4 & S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

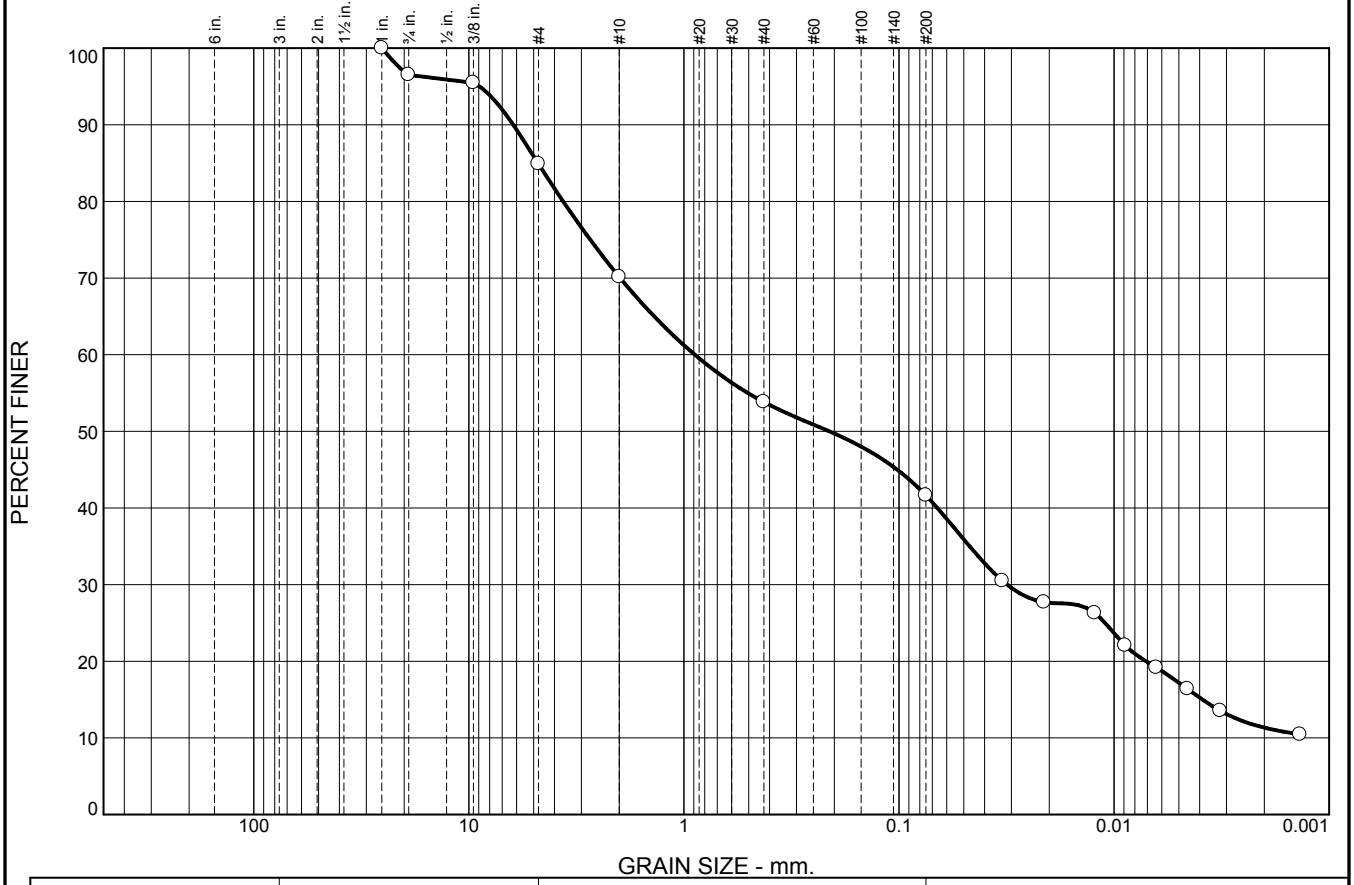
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 3

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.5	11.6	14.7	16.4	12.2	24.4	17.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			4.7718	0.8901	0.2110	0.0314	0.0039			

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY SAND WITH GRAVEL	12/08/20	SM	14.2

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-5 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 4

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	21.1	8.9	10.2	12.0	32.3	15.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.3958	0.4397	0.0900	0.0271	0.0046	0.0022	0.76	198.48

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY SAND WITH GRAVEL	12/08/20	SM	11.8

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-5 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

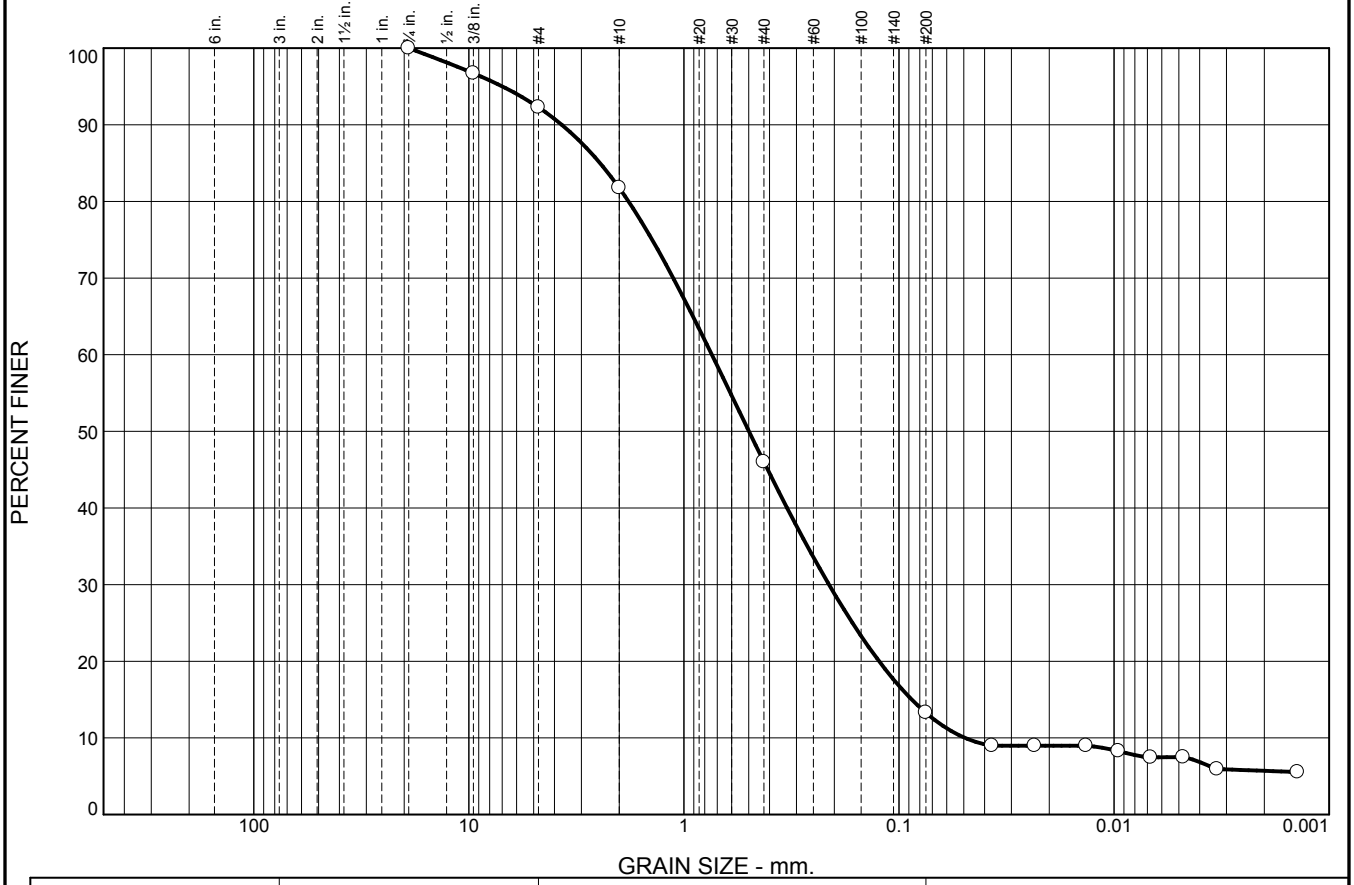
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 5

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	7.7	10.5	35.8	32.7	5.8	7.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.4558	0.7416	0.4987	0.2116	0.0872	0.0494	1.22	15.02

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY, CLAYEY SAND	12/08/20	SC-SM	7.2

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-6 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

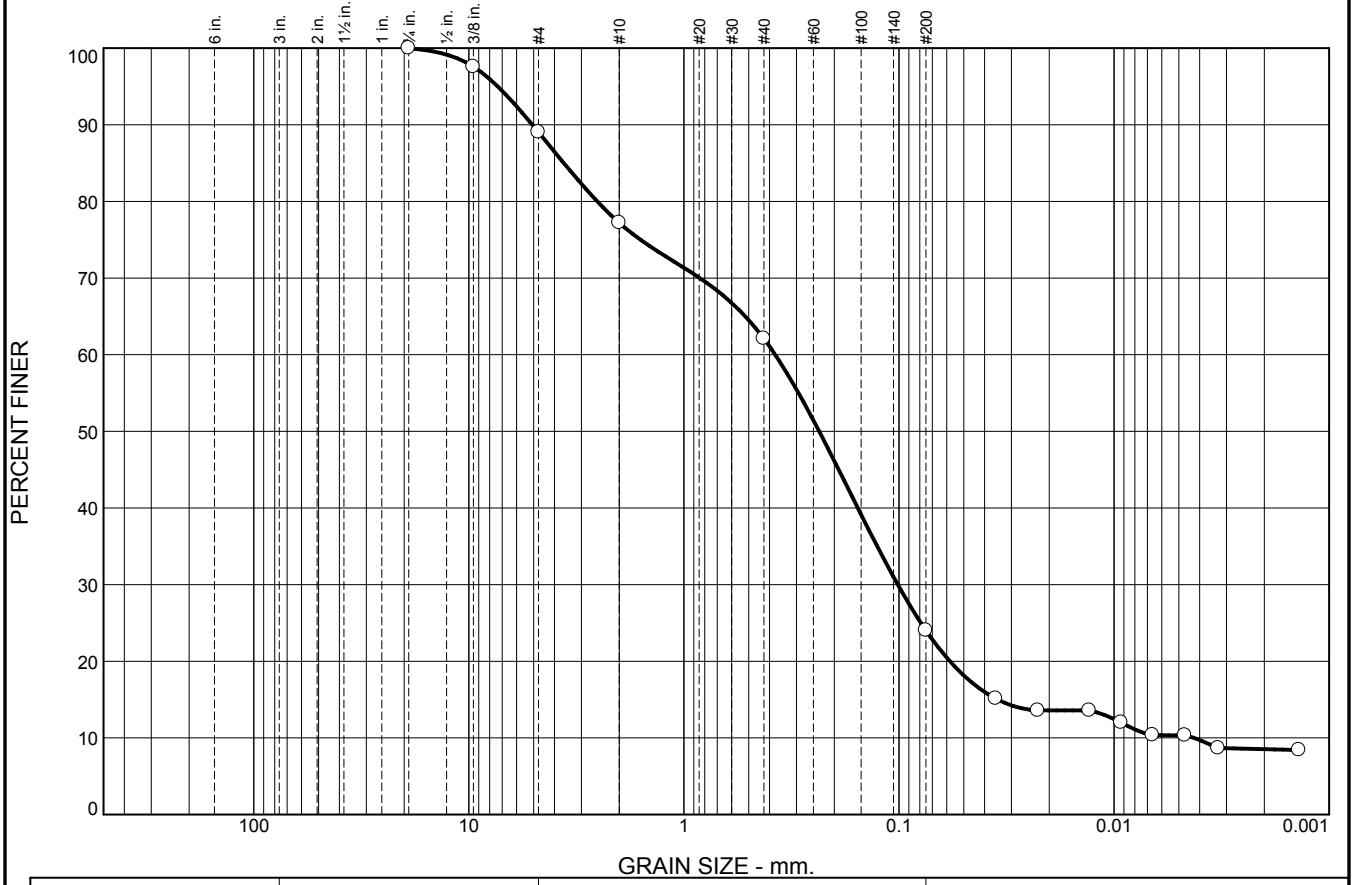
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 6

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	11.0	11.8	15.1	38.1	13.7	10.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.6180	0.3764	0.2350	0.1013	0.0348	0.0042	6.43	88.80

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ RED-BROWN SILTY, CLAYEY SAND	12/08/20	SC-SM	12.6

Project No. 422671 **Client:** REMINGTON & VERNICK ENGINEERS

Project: CALDWELL ELIZABETHTOWN PARKING DECK

○ **Source of Sample:** B-7 **Depth:** 6.0-10.0 FT **Sample Number:** S-4 & S-5

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 7

Tested By: CWZ 12/08/20 **Checked By:** JPB 12/08/20

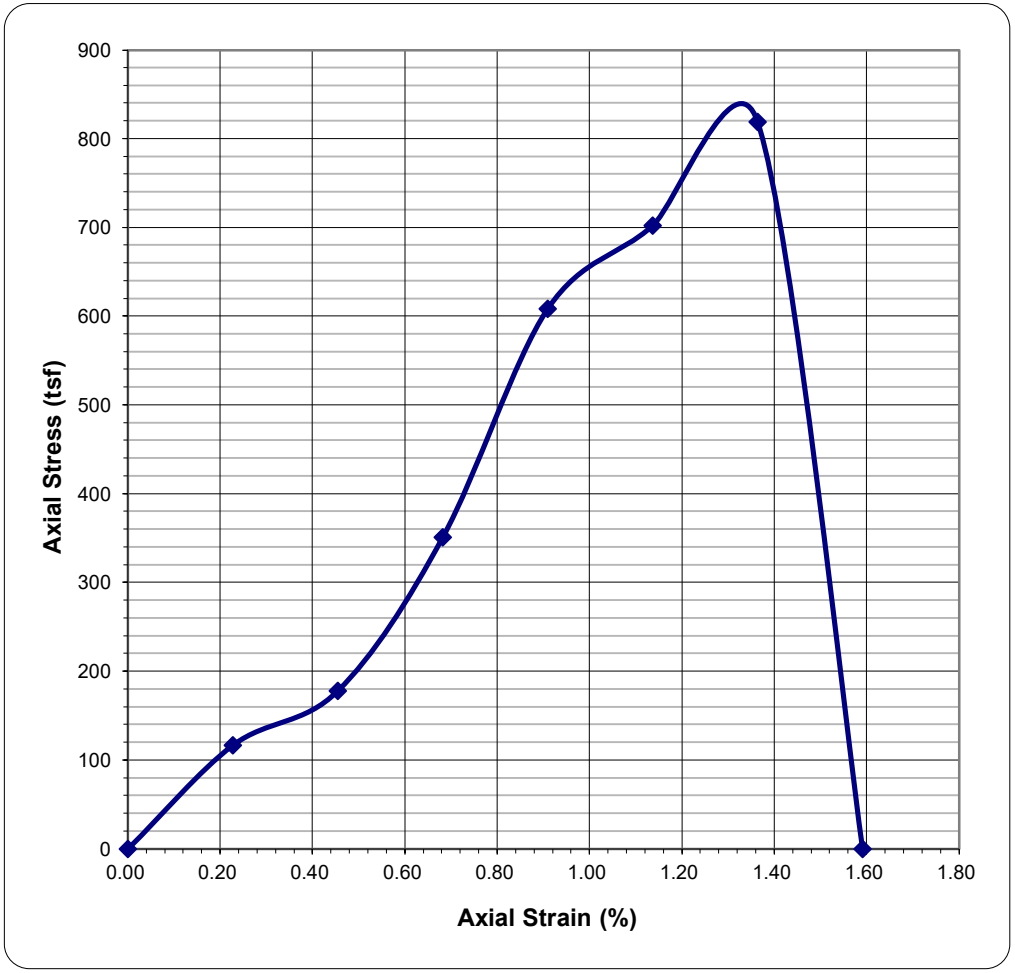
TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name:	Caldwell Elizabethtown Parking Deck				
Project No.:	422671.0000	**Average Sample Diameter (in.):**	1.979	**Sample Description:**	
Boring No.:	B-4	**Cross Sectional Area (sq. in.)**	3.076	RED-BROWN	
Sample No.:	C-1	**Average Sample Height (in.):**	4.400	SHALE	
Depth (ft):	10.0-15.0	**Sample Mass (g):**	564.22		
		Unit Weight (PCF)	158.8		

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	5000	0.23	117
0.020	7600	0.45	178
0.030	15000	0.68	351
0.040	26000	0.91	609
0.050	30000	1.14	702
0.060	35000	1.36	819
0.070	0	1.59	0



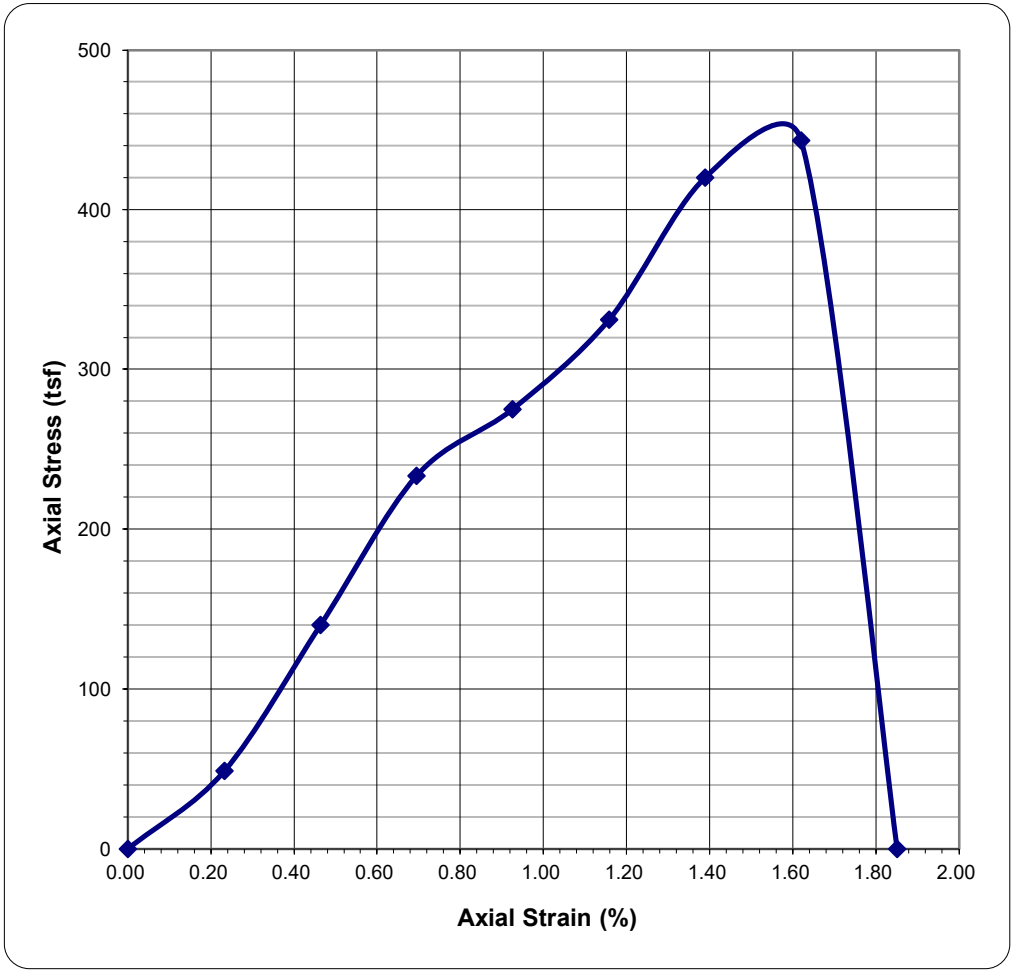
TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name:	Caldwell Elizabethtown Parking Deck				
Project No.:	422671.0000	**Average Sample Diameter (in.):**	1.982	**Sample Description:**	
Boring No.:	B-6	**Cross Sectional Area (sq. in.)**	3.086	RED-BROWN	
Sample No.:	C-1	**Average Sample Height (in.):**	4.322	SHALE	
Depth (ft):	13.0-18.0	**Sample Mass (g):**	563.05		
		Unit Weight (PCF)	160.9		

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	2100	0.23	49
0.020	6000	0.46	140
0.030	10000	0.69	233
0.040	11800	0.93	275
0.050	14200	1.16	331
0.060	18000	1.39	420
0.070	19000	1.62	443
0.080	0	1.85	0



APPENDIX 2

PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT AND PRE-DEMOLITION ASBESTOS ABATEMENT WORK PLAN

PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT

INVESTIGATION FOR**:**	John Bolan Paulus, Sokolowski & Sartor, LLC 67B Mountain Boulevard Extension Warren, NJ 07059
SITE INVESTIGATED:	Union County Caldwell & Elizabethtown Parking Deck Elizabeth Plaza & Caldwell Place Elizabeth, NJ
ASSESSMENT BY:	Omega Environmental Services, Inc. 280 Huyler Street South Hackensack, NJ 07606
INVESTIGATION CONDUCTED:	October 1, 2020
DATE OF REPORT:	October 20, 2020
REPORT PREPARED BY:	Ana Knezevic
REPORT REVIEWED BY:	Veronica Kero, CIH, PE

(Omega Project # 20-1205)

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

TABLE OF CONTENTS

EXECUTIVE SUMMARY:

Omega Environmental Services was retained by Paulus, Sokolowski & Sartor (PS&S), LLC to conduct a hazardous/regulated material investigation of the parking deck building located at Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201.

At the time of the investigation, the building was partially occupied.

The inspection included a visual assessment, and representative sampling/analysis of suspect Asbestos Containing Materials (ACM), Lead Based Paint (LBP), and PCBs (in caulking). This inspection also included a visual inspection for other possible suspect PCB containing materials, mercury-containing materials, hazardous material storage, and other areas of concern.

A few items of concern were noted, as summarized below, and delineated further in this report.

Due to the extensive asbestos abatement scope delineated, preparation of an asbestos bid specification is highly recommended.

Site Description:

The 1960's structure consists of split level parking spaces from level 1 through 6. The 7th floor is occupied by the Newark Department of Corrections. The space includes meeting/office spaces, holding cells, exercise areas, and other related support spaces. The building is being prepared for demolition.

Previous Survey and Decontamination Work:

No documentation of any previous survey work performed in the subject area was provided.

Summary of Findings:

The following summarizes the hazardous or regulated materials identified:

Elizabeth Plaza & Caldwell Place, NJ Pre-Renovation Hazardous Material Summary For Eastern and Western Garage Structures			
Parameter Investigated	Suspected Positive Materials	Estimated Total Quantity of Material	Recommended Action
Asbestos (ACM)	Roof MER - Fitting	Approx. 2 Each	-Abate/remove by licensed asbestos Contractor. -Selective demolition required to expose all materials
	Deck #1 Security Control Bath – Fitting	Approx. 2 Each	
	Basement Deck Sprinkler Room – Fitting	Approx. 3 Each	
	Basement Deck Elevator Room – Fitting	Approx. 4 Each	
	7th Floor Cell Chase – SOFP (Concealed)	Throughout (Estimate - Approx. 2,300 SF)	
	6th Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	5th Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	4th Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	3rd Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	2nd Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	1st Floor Deck – Ceiling Texture/Stucco	Approx. 14,000 SF	
	Basement Deck – Ceiling & Wall Texture/Stucco	Approx. 14,500 SF	
	Main Roof – Vent Flashing Bottom Layer	Approx. 300 SF (5 Vents)	
	Main Roof – Door Caulking A&B	Approx. 2 Doors (36"x80")	
	7th Floor (Exterior) – Brick Expansion Joint	Unquantified (N/A)	
	6th Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	5th Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	4th Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	3rd Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	2nd Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	1st Floor Deck – Brick Expansion Joint	Approx. 32 LF	
	7th Floor – Roofs (Interior)	Unquantified	

Elizabeth Plaza & Caldwell Place, NJ Pre-Renovation Hazardous Material Summary For Eastern and Western Garage Structures			
Parameter Investigated	Suspected Positive Materials	Estimated Total Quantity of Material	Recommended Action
Lead Based Paint (LBP)	Exterior – Roof Entrance by Caldwell Pl – Ladder (Metal)	Two (2)	Conduct demolition activities in accordance with OSHA *Lead in Construction Standard*
	Exterior – Roof Entrance by Caldwell Pl – Pipe (Metal)	One (1)	
	Exterior – Roof Entrance – Pipe (Metal)	One (1)	
	Exterior – Roof Entrance – Ladder (Metal)	One (1)	
	Staircase 7th Floor – Stair Railing (Metal)	Two (2)	
	Staircase 6th Floor – Stair Underside (Metal)	Two (2)	
	Staircase 6th Floor – Stair Railing (Metal)	Two (2)	
	Staircase 4th Floor – Stair Underside (Metal)	One (1)	
	Staircase by Caldwell Place 1st Floor – Stair Underside (Metal)	One (1)	
	Staircase by Caldwell Place 6th Floor – Vertical Pipe (Metal)	One (1)	
	7th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	
	9th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	
	10th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	
	Upper Basement OSY Valves Pump Room – Fire Pipe (Metal)	Two (2)	
PCBs	Fluorescent light ballasts	170 Ballasts	Remove from fixture and dispose of as PCB Bulk product segregated waste during renovation.
	Transformers	No suspect PCB transformers noted.	None
	Caulking	Trace levels (< 50 ppm) in 4 types sampled. 5 other types identified, but not sampled.	Verify that the disposal facility will accept materials with trace levels of PCBs; assume other types of caulk are TSCA PCB Bulk Product Waste unless tested.

Elizabeth Plaza & Caldwell Place, NJ Pre-Renovation Hazardous Material Summary For Eastern and Western Garage Structures			
Parameter Investigated	Suspected Positive Materials	Estimated Total Quantity of Material	Recommended Action
Mercury	Fluorescent light bulbs	1,100 bulbs	Remove and dispose of as mercury-containing universal waste during renovation.
	Thermostats, timers, misc.	2 mangehelic gauges in basement pump room. No suspect mercury thermostats noted.	Remove and dispose of as mercury-containing equipment during renovation.
	High-Intensity Floodlights	200 bulbs	Remove and dispose of as Universal Waste prior to demolition.
Chemical Storage/tanks	Drums, tanks or significant chemical storage.	- Nine 55 gallon drums of antifreeze- - Nine pallets of ice melter.	Remove and dispose of prior to demolition
	USTs/ASTs	None identified	None
	Misc. paints, solvents, adhesives, small misc. fluids	De minimus quantities.	Remove and dispose of prior to demolition
	Staining	No significant staining observed other than is typical for a parking garage	None
	Batteries	None observed	None
Biological Concerns (mold, bird feces, sewage)	Water damage/mold growth	None observed	None
Other/Miscellaneous	Boiler Systems	None identified	None
	Refrigerant Systems	Rooftop HVAC units are present.	Extract refrigerant prior to demolition of systems
	Compressor Systems	None identified	None

1 ASBESTOS SURVEY:

1.1 Summary:

Omega Environmental Services, Inc. (Omega) was been retained by Paulus, Sokolowski & Sartor, LLC to conduct an asbestos survey of the Union County Caldwell & Elizabethtown Parking Deck located at Elizabethtown Plaza & Caldwell Place in Elizabeth, NJ 07201 to confirm the presence/absence of accessible asbestos containing materials (ACM).

Notes:

- 7th floor cells had limited access above ceiling; possible concealed TSI/ACM Pipe Insulation inside the walls and ceilings.
- Presumed concealed SOFP/PACM on walls and above ceiling on deck and/or structural components.
- Two (2) interior/covered roofs with no access.
- No drawings available.

1.1.1 ACM identified:

The following materials were classified as regulated ACM (asbestos at concentrations above 1%):

LOCATION	MATERIAL DESCRIPTION	ASSESSED CONDITION	ESTIMATED QUANTITY* (square/linear feet)
Roof MER	Fitting	No Visible Damage	Approx. 2 Each
Deck #1 Security Control Bath	Fitting	No Visible Damage	Approx. 2 Each
Basement Deck Sprinkler Room	Fitting	No Visible Damage	Approx. 3 Each
Basement Deck Elevator Room	Fitting	No Visible Damage	Approx. 4 Each
7th Floor Cell Chase	SOFP (Concealed)	Unknown	Throughout (Estimate - Approx. 2,300 SF)
6th Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
5th Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
4th Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
3rd Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
2nd Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
1st Floor Deck	Ceiling Texture/Stucco	Damaged	Approx. 14,000 SF
Basement Deck	Ceiling & Wall Texture/Stucco	Damaged	Approx. 14,500 SF
Main Roof	Vent Flashing Bottom Layer	No Visible Damage	Approx. 300 SF (5 Vents)
Main Roof	Door Caulking A&B	No Visible Damage	Approx. 2 Doors (36"x80")
7th Floor (Exterior)	Brick Expansion Joint	No Visible Damage	Unquantified (N/A)

6th Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
5th Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
4th Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
3rd Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
2nd Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
1st Floor Deck	Brick Expansion Joint	No Visible Damage	Approx. 32 LF
7th Floor	Roofs (Interior)	Assumed ACM	Unquantified
*Since asbestos materials potentially continue through adjoining areas and/or layers, final asbestos abatement quantitates scope have to be determined in the field when project details are confirmed.			

1.2 Scope of Work:

Omega conducted a pre-demolition asbestos survey of the Union County Caldwell & Elizabethtown Parking Deck located at Elizabethtown Plaza & Caldwell Place in Elizabeth, NJ 07201 which is scheduled for a demolition and or renovation. Purpose of this investigation was that asbestos containing materials (ACM) could be identified and abated prior to the onset of potential renovation activities as per *EPA NESHAPS*, *OSHA, and NJ DOL* requirements.

1.2.1 Materials Tested:

Considering the age of the building, it was determined that the following **suspect** asbestos-containing materials (ACM) were observed, and were subsequently **tested** for presence/absence of asbestos:

- 12"x12" F.T.
- 2'x'2' CT
- 2'x4' Ceiling Tile
- 2nd Layer
- 3rd Layer
- 4th Layer
- 5th Layer
- Air Vent Flashing
- Bottom Layer
- Bottom Unit Flashing Material
- Brick
- Brick Expansion Joint
- Caulking Around Doors
- Caulking Around Material Flashing
- Ceiling Drywall
- Ceiling Texture/Stucco
- CMU Glaze
- Concrete Decking
- Concrete Walls Expansion Joint
- Drywall
- Expansion Joint White
- Fitting
- Flashing
- Flooring Epoxy
- Grout
- Interior Brick
- Interior Mortar
- Joint Compound
- Mastic Under F.T.
- Mastic Under Floor Tile
- Mortar
- Pitch Pocket Material
- Roofing 2nd Layer
- Roofing 3rd Layer
- Roofing Bottom Layer
- Roofing Top Layer
- SOFP Gray
- SOFP Green
- SOFP I Beam/Column
- SOFP White

- Thinset
- Top Layer
- Top Unit Flashing Material
- Unit Flashing Bottom
- Unit Flashing Top
- Vent Flashing Bottom Layer
- Vent Flashing Top Layer
- Wall Texture/Stucco

Positive ACM materials above are highlighted.

1.2.2 Non-ACM:

The following materials were sampled, analyzed and identified to be **non-ACM**, with asbestos either not detected or detected in concentrations of less than one percent (1%):

- 12"x12" F.T.
- 2'x'2' CT
- 2'x4' Ceiling Tile
- 2nd Layer
- 3rd Layer
- 4th Layer
- 5th Layer
- Air Vent Flashing
- Bottom Layer
- Bottom Unit Flashing Material
- Brick
- Caulking Around Material Flashing
- Ceiling Drywall
- CMU Glaze
- Concrete Decking
- Concrete Walls Expansion Joint
- Drywall
- Expansion Joint White
- Flashing
- Flooring Epoxy
- Grout
- Interior Brick
- Interior Mortar
- Joint Compound
- Mastic Under F.T.
- Mastic Under Floor Tile
- Mortar
- Pitch Pocket Material
- Roofing 2nd Layer
- Roofing 3rd Layer
- Roofing Bottom Layer
- Roofing Top Layer
- SOFP Gray
- SOFP Green
- SOFP I Beam/Column
- Thinset
- Top Layer
- Top Unit Flashing Material
- Unit Flashing Bottom
- Unit Flashing Top
- Vent Flashing Top Layer

1.3 Sampling Methodology:

The information that is contained in this report is based upon the following:

- Information which was provided by the building representatives interviewed.
- A visual inspection of the designated building areas supported by a representative sampling required to comply with EPA protocol for asbestos building surveys.
- Laboratory analysis of bulk samples of various materials collected from representative building areas that were suspected to contain asbestos. An accredited laboratory using PLM and TEM/NOB analysis methods performed the analysis.

The asbestos survey was conducted on October 1, 2020, by accredited USEPA AHERA Asbestos Inspectors. The bulk samples, which were representative of suspect ACM observed and are required by the USEPA, were collected as necessary. Multiple samples of each homogeneous material were

collected and analyzed by each discernible layer. According to USEPA, a building material with an asbestos concentration greater than one percent (>1%) is considered to be ACM.

Bulk samples were submitted to ELAP accredited Laboratory Testing Services/accreditation # 10955 and Omega Laboratories/accreditation # 10504 utilizing sealed chain-of-custody procedures.

1.4 Unknown Variables/Areas Not Accessible for Sampling:

Inaccessible Areas

- **7th floor above cells was limited access. Additional probe cut required when contractor mobilized.**
- Enclosed wall/ceiling/chase assemblies
- Boiler/mechanical system interiors
- Inaccessible façade/roof layers
- Foundation slab edges and other sub surfaces materials will not be accessible for investigation excavation until equipment is mobilized.

1.5 Review of Previous Asbestos Surveys, Renovations or Abatement Work:

Not available for review.

1.6 Sampling Limitations/Conditions:

The following limitations/exclusions apply:

1. Asbestos bulk sampling report should not be used as sole reference source to determine Contractor scope of work – additional field coordination required in order to generate "Abatement Work Plan".
2. If scope of renovation changes, and/or walls/ceilings/chases/flooring opened, then additional asbestos bulk sampling may be required at a later date.
3. All sampling is representative in nature and does not reflect every square inch of material.
4. Findings are representative of site conditions on the day of investigation.
5. Subject survey conducted according to published regulations in effect on survey date.

1.7 ACM Conclusions and Recommendations

Conclusions:

1. ACM has been identified in the form of brick expansion joint, caulking around doors, ceiling texture/stucco, fitting, SOFP white, vent flashing bottom layer and wall texture/stucco.
2. This survey was based on visual observations of accessible interior/exterior areas of the subject building. Omega's inspection team performed limited intrusive/invasive inspections at random locations in order to ascertain presence/absence of ACM that may be concealed within pipe chases, in wall cavities and above ceiling plenums.

3. Asbestos abatement activities must be conducted in accordance with NJ DOL Regulations, and other applicable federal, state and local requirements governing removal and disposal of regulated ACM utilizing licensed workers.

Recommendations:

- **Prepare abatement Design Documents to identify the locations of ACM and work practices to be employed during this project. This work should be performed by the USEPA AHERA accredited Asbestos Project Designer.**
- **Third party asbestos final clearance testing required prior to building demolition or new occupancy. Daily asbestos air sampling during abatement also recommended.**
- **Any building material that is not listed in this report and/or tested must be assumed to be ACM and treated as ACM until confirmed otherwise via laboratory testing.**

2 LEAD BASED PAINT (LBP):

2.1 XRF Testing:

2.1.1 XRF Summary:

On October 1, 2020, Omega Environmental Services Inc. (Omega) conducted a lead-based paint screen survey using XRF (x-ray fluorescence). Representative painted building and site components were classified as having lead-based (LBP) or non-LBP present. The inspection was intended for pre-demolition survey purposes only, and not intended to follow USEPA HUD protocol, and was not designed for certification or occupancy purposes.

The presence of LBP in the buildings indicates that the demolition Contractor should follow OSHA *Lead in Construction Standard* (LCS). LBP on metal components that are to be torch cut in relation to demolition should be abated in the area of the cut points prior to cutting. Other materials that may have LBP do not require special treatment. Intact LBP coated components may be disposed of intact as normal construction debris contingent upon acceptable representative TCLP lead test results.

2.1.2 XRF Sampling Methodology:

Omega performed XRF screening for lead within the subject building using a Niton XLp 300A Analyzer. The inspection was conducted by Darren Slack, an EPA/NJ Lead Inspector/Risk Assessor.

The certified Lead Inspector/Risk Assessor performed a lead based paint (LBP) inspection of representative accessible building areas so that presence/absence of LBP can be verified for the subject building in areas which is expected to be demolished to grade.

2.1.3 XRF Clearance Criteria:

The USEPA defines Lead Based Paint as paint having a lead level equal to or exceeding 1.0 mg/cm^2.

2.1.4 XRF Results Summary:

The XRF results section of this report provides a listing of all the reading collected during the inspection, organized by building, component, and type of material. The positive readings, if any, are highlighted and include those readings that were at or above the action level 1.0 mg/cm^2.

The following components **were found to be covered with lead containing paint/primer**:

Location	Component	Type of Material	Quantity of Positive LBP Readings
Exterior-Roof Entrance by Caldwell Pl	Ladder	Metal	2
	Pipe	Metal	1
Exterior-Roof entrance	Pipe	Metal	1
	Ladder	Metal	1
Staircase 7th Fl	Stair Railing	Metal	2
Staircase 6th Fl	Stair Underside	Metal	2
	Stair Railing	Metal	2
Staircase 4th Fl	Stair Underside	Metal	1
Staircase by Caldwell Place 1st Floor	Stair Underside	Metal	1
Staircase by Caldwell Place 6th Floor	Vertical Pipe	Metal	2
7th Floor Training Center Private Hallway	Wall	Concrete	1
9th Floor Training Center Private Hallway	Wall	Concrete	1
10th Floor Training Center Private Hallway	Wall	Concrete	1
Upper Basement OSY Valves Pump Room	Fire Pipe	Metal	2
**Additional LBP/primer is likely to be identified on steel structures and or concealed components			

LBP ***was not*** identified on the following components:

Location	Component	Type of Material	Quantity of Non-LBP Results
Exterior-Roof	Door	Metal	1
	Door Buck	Metal	1
	Pipe	Metal	3
Exterior-Roof Entrance by Caldwell Pl	Door	Metal	2
	Door Buck	Metal	1
	Pipe	Metal	1
Roof Penthouse	Ceiling	Concrete	1
	Wall	Wood	1
	Door	Metal	1
Staircase 7th Fl	Stair Treads	Metal	1
	Stair Stringer	Metal	1
	Wall	Concrete	3
	Ceiling	Concrete	1
	Pipe	Metal	1
Staircase 6th Fl	Wall	Concrete	4
	Vertical Pipe	Metal	1
Staircase 5th Fl	Ceiling	Concrete	1
	Stair Underside	Metal	1
Staircase 4th Fl	Stair Underside	Metal	1
	Wall	Concrete	2
Staircase Basement	Door	Metal	1
Staircase by Caldwell Place Basement	Door	Metal	1
	Door Buck	Metal	1
	Wall	Concrete	2
Staircase by Caldwell Place 1st Floor	Wall	Concrete	1
	Window Sill	Concrete	1

Staircase by Caldwell Place 1st Floor	Stair Railing	Metal	2
	Stair Treads	Concrete	1
	Stair Stringer	Metal	1
	Stair Underside	Metal	2
Staircase by Caldwell Place 3rd Floor	Wall	Concrete	2
Staircase by Caldwell Place 6th Floor	Wall	Concrete	2
	Stair Underside	Metal	1
	Stair Newel Post	Metal	1
	Stair Railing	Metal	1
	Vertical Pipe	Metal	4
6th Floor Garage	Wall	Concrete	2
	Column	Concrete	1
	Elevator Door	Metal	1
	Elevator Buck	Metal	1
5th Floor Garage	Column	Concrete	2
	Wall	Concrete	1
12th Floor Garage Ramp	Wall	Concrete	1
	Elevator Door	Metal	1
1st Floor Garage	Door Buck	Metal	1
7th Floor Training Center	Wall	Concrete	1
	Door	Metal	1
	Door Buck	Metal	1
	Radiator	Metal	1
7th Floor Training Center GYM	Wall	Concrete	2
	Door	Metal	1
	Ceiling	Plaster	1
7th Floor Training Center Bathroom	Window Frame	Metal	1
8th Floor Training Center Private Hallway	Wall	Concrete	1
7th Floor Training Center Corner Cell	Ceiling	Metal	1
7th Floor Training Center Cell	Ceiling	Metal	1
Upper Basement OSY Valves Pump Room	Electrical Panel	Metal	1
	Door Buck	Metal	1
	Door	Metal	1
	Fire Pipe	Metal	4
Lower Basement Electrical Room	Wall	Metal	2
Lower Basement Garage	Wall	Concrete	2
Lower Basement Electrical Room	Door Buck	Metal	1
Lower Basement Garage Roadway Ramp	Wall	Concrete	1
Exterior	Wall	Concrete	2
Exterior-Front of Garage	Gas Pipe	Metal	1
	Foundation	Concrete	1
Exterior- Caldwell Side	Fire Pipe	Metal	1

See *Appendix Table C1* for all XRF reading collected and specific location of each.

NOTE: Lead Based Paint (LBP) via XRF testing is defined as paint having lead at or above 1 mg/cm^2. However, OSHA *Lead in Construction Standard* applies to substrates coated with paint having *any detectable amount of lead.*

2.2 LBP Findings:

The USEPA defines Lead Based Paint as paint having a lead level equal to or exceeding 1.0 m/cm^2.

2.3 XRF Recommendations:

- **Remove/impact LBP components in accordance with OSHA Lead in Construction Standard.**

3 PCBs:

3.1 Fluorescent Light Ballasts:

Fluorescent lights fixtures and associated ballasts historically have contained Polychlorinated Biphenyls (PCBs). Normally, light ballasts are assumed to contain PCBs unless specifically labeled as "non-PCB".

Light fixtures are as follows:

Area	Fixture size	Qty. of fixtures	Bulb Length	#of bulbs/ fixture	Est ballasts /fixture	Est. total qty. of ballasts.	Total qty. of bulbs
7th floor, 1st floor security office, misc. spaces	2' x 4'	20	4'	3	2	40	60
	2' x 2'	24	2'	3	2	48	72
	1' x 4'	75	4'	1	1	75	75
				Totals		**163**	**207**
Parking garage, stairwells						Flood Lights	**240**

For estimation purposes assume **170 ballasts.**

Ballasts labeled as no PCBs may be disposed of as normal demolition debris. An inspection of each ballast would be required. Alternately, all ballasts may be assumed to contain PCBs and disposed of as PCB bulk product waste.

3.2 Transformers:

Two dry-type transformers are located in the basement mechanical spaces. Dry transformers do not have PCB cooling fluids.

3.3 Caulking:

Caulking is present in various forms throughout the building. Noted potential PCB caulking includes the following:

Description	Locations	Est Quan.	Comments
Penthouse exterior wall, near roof level, and around doors	Penthouse	120 ft.	Sample 1205-01C
Column to brick, north and south sides	Parking Garage, all levels	50 ft.	Sample 1205-02C
Wall to brick, north and south sides	Parking Garage, all levels	75 ft.	Sample 1205-03C
Deck centerline double columns	Parking Garage, all levels	400 ft.	Sample 1205-04C
Deck centerline expansion joint (east to west)	Parking Garage, all levels	750 ft.	Not sampled
Exterior wall, deck centerline expansion joint	Parking Garage, all levels	30 ft.	Not sampled
Exterior beneath deck seam approx. 8'	Near ground level, exterior	400 ft.	Not sampled

above ground level, N, W, and S sides			
Exterior of bridge	Bridge	80 ft.	Not sampled
Windows (stairwells, 7th floor exercise spaces, offices, bridge) – includes possible window glazing	Misc.	Approx. 40 windows	Not sampled

Additional PCB containing caulk likely exists on the structure.

As noted above samples were collected of four types of caulking.

Total PCBs in the table below consists of the following:
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Sample #	**Location/ Description**	**Analysis**	**Result (mg/kg)**	**Limit [1]**
1205-01C	Penthouse exterior wall, near roof level	PCBs	1.360	50 ppm
1205-02C	Column to brick, north and south sides	PCBs	2.820	50 ppm
1205-03C	Wall to brick, north and south sides	PCBs	3.280	50 ppm
1205-04C	Deck centerline double columns	PCBs	1.950	50 ppm

[1] TSCA PCB Bulk Product Waste Limit

All results of caulking sampled are below the limit for TSCA PCB Bulk Product Waste.

Caulking not sampled should be presumed to be PCB Bulk Product Waste unless sampled.

3.4 PCB Conclusions and Recommendations:

1. **Dispose of all light ballasts as PCB containing waste unless specifically labeled as "No PCBs".**
2. **Verify that the disposal facility will accept materials with trace levels of PCBs.**

4 MERCURY:

4.1 Fluorescent Light Bulbs/High-Intensity Floodlights:

Area	Fixture size	Qty. of fixtures	Bulb Length	#of bulbs/ fixture	Est ballasts /fixture	Est. total qty. of ballasts.	Total qty. of bulbs
7th floor, 1st floor security office, misc. spaces	2' x 4'	20	4'	3	2	40	60
	2' x 2'	24	2'	3	2	48	72
	1' x 4'	75	4'	1	1	75	75
				Totals		**163**	**207**
Parking garage, stairwells						Flood Lights	**240**

For estimation purposes, assume 210 florescent light bulbs and 240 floodlights.

Mercury content of fluorescent bulbs has decreased over recent years. Non-mercury bulbs generally have green tips on the ends. These may contain low levels of mercury but are considered to be non-hazardous.

Although some of the bulbs may contain mercury at levels below disposal regulatory limits, the number of types of bulbs, and the lack of any discernible location pattern of specific types, indicate that further investigation/delineation of possible unregulated bulbs may be cost prohibitive.

Therefore, unless the absence of mercury can be confirmed, all bulbs should be carefully removed, packaged, and disposed of as mercury-containing universal waste.

High-intensity floodlights may contain heavy metal vapors that may be released if the bulb is broken. Any high-intensity bulbs on the site should be carefully removed, packaged to prevent breakage, and disposed of as universal waste. Generally, these exist through the parking garage spaces and stairwells.

4.2 Thermostats, Switches, and Timers:

Thermostats historically contained a mercury bulb that act as a switch for an HVAC system. These bulbs are readily observed when the cover is removed.

Two magnehelic switch gauges are located in the basement pump room. These contain one to two mercury bulbs each.

Thermostats inspected on the 7th floor are electronic (no mercury bulbs).

Any thermostats suspected of having a mercury-containing bulb should be disposed of mercury-containing waste.

Although it may be possible to remove the mercury bulbs from the thermostats, the risk of a potential spill for the small quantity of mercury-containing does warrant attempted separate removal of mercury bulbs from the thermostats.

4.3 Mercury Conclusions and Recommendations:

- **All fluorescent bulbs without green tips and high-intensity floodlights should be carefully removed, packaged, and disposed of as mercury-containing universal waste.**
- **Remove, package, and dispose of all suspect thermostats, timers, and switches as mercury-containing universal waste.**

5 CHEMICAL STORAGE:

5.1 Drums, Tanks, and Chemical Storage:

- Nine (9) 55-gallon drums of Dowtherm Ethylene Glycol anti-freeze are located on the basement level B-L.
- Nine (9) pallets of ice melt product are located on level 2L.

No other significant chemical storage was noted.

5.2 Underground Storage Tanks (USTs) and Above Ground Storage Tanks:

No USTs or AST were identified on the property.

This investigation was limited to visual observation of the surface. It did not include sub-surface evaluations (such as Ground-penetrating Radar) or a record research.

5.3 Paints, Solvents, Adhesives, and Small Misc. Fluids:

Approximately 15 gallons of paint are located on the 7th floor in 1 and 5-gallon containers.

5.4 Batteries:

No batteries of concern were identified on the property.

5.5 Staining:

No significant staining was noted through the building, other than is typical for a parking garage.

5.6 Chemical Storage Conclusions and Recommendations:

- **Remove and dispose of paints, antifreeze, and ice melt product.**
- **Investigate any items not previously identified for proper disposal.**

6 BIOLOGICAL CONCERNS (other than mold):

6.1 Sanitary Sewers:

No open sewers, spills, leaks, or sewer odors were noted.

6.2 Bird Feces:

No significant bird feces were observed in the subject area.

6.3 Biological Concerns Conclusions and Recommendations:

- **No further action is recommended in regards to potential Biological Concerns in the subject area**.

7 OTHER/MISCELLANEOUS:

7.1 Mechanical Equipment:

7.1.1 *Boiler Systems*:

Boilers often have anti-corrosion treatment chemicals that would require special disposal procedures.

No boilers were noted within the structure.

7.1.2 *Refrigerant Systems*:

Refrigerants such as Freon require special extraction and disposal procedures.

Several rooftop HVAC units are located on the main roof.

A few household type refrigerators are also present in various spaces (7^{th} floor).

7.1.3 *Compressor Systems:*

Compressors often contain various oils and lubricants that should be extracted and properly disposed of prior to demolition of equipment.

No compressors were identified in the structure.

7.1.4 *Elevators:*

Two cable-driven elevators are present in the building. The pit of the main elevator has minimal signs of grease and water.

7.2 Other/Miscellaneous Conclusions and Recommendations:

- **Extract refrigerant from associated systems prior to demolition.**

8 SUMMARY OF RECOMMENDATIONS:

8.1 ACM Recommendations:

- Prepare abatement design documents to identify the locations of ACM and work practices to be employed during this project. This work should be performed by the USEPA AHERA accredited Asbestos Project Designer.
- Third-party asbestos final clearance testing required prior to building demolition or new occupancy. Daily asbestos air sampling during abatement also recommended.
- Any building material that is not listed in this report and/or tested must be assumed to be ACM and treated as ACM until confirmed otherwise via laboratory testing.

8.2 LBP in Paint Recommendations:

- Remove/impact LBP components in accordance with OSHA Lead in Construction Standard.

8.3 PCB Recommendations:

- Dispose of all light ballasts as PCB containing waste unless specifically labeled as "No PCBs".
- Verify that disposal facility will accept materials with trace levels of PCBs.

8.4 Mercury Recommendations:

- All fluorescent bulbs *without* green tips and high-intensity floodlights should be carefully removed, packaged, and disposed of as mercury-containing universal waste.
- Remove, package, and dispose of all suspect thermostats, timers, and switches as mercury-containing universal waste.

8.5 Chemical Storage Recommendations:

- Remove and dispose of paints, antifreeze, and ice melt product.
- Investigate any items not previously identified for proper disposal.

8.6 Biological Concerns Recommendations (excluding mold):

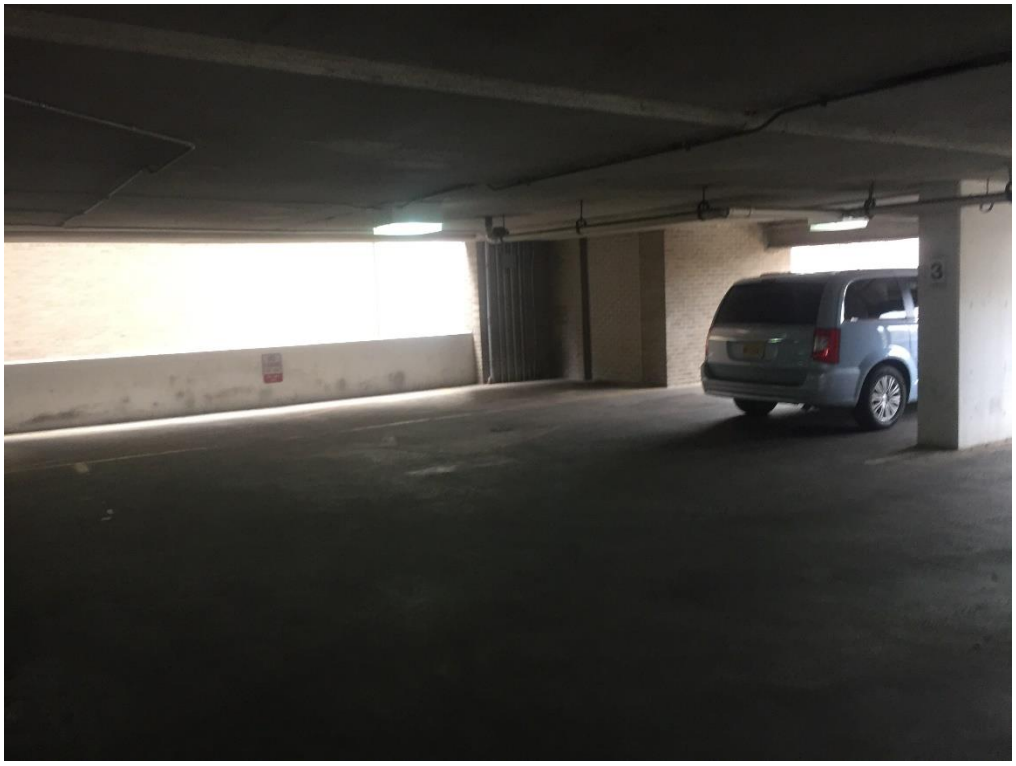
- No further action is recommended in regard to potential Biological Concerns in the subject area.

8.7 Other/Miscellaneous Recommendations:

- Extract refrigerant from associated systems prior to demolition.

9.1 Site Photographs

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412



Ceiling Stucco

Ceiling Stucco

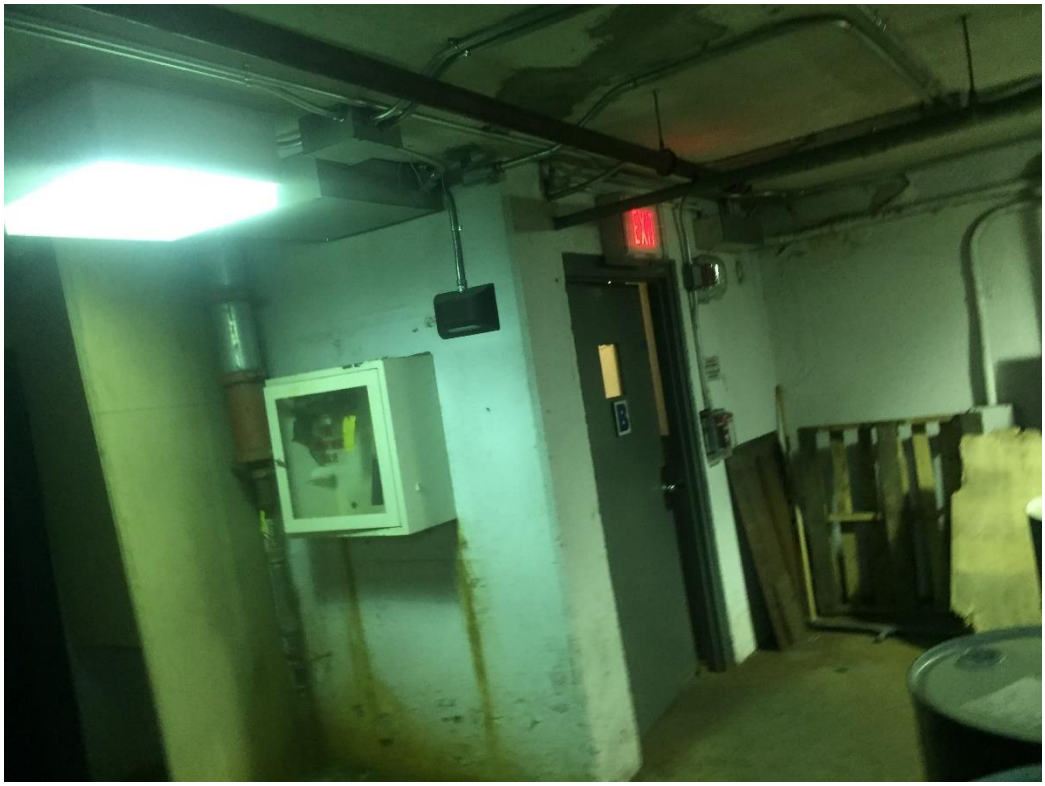
Concrete Decking

Stucco

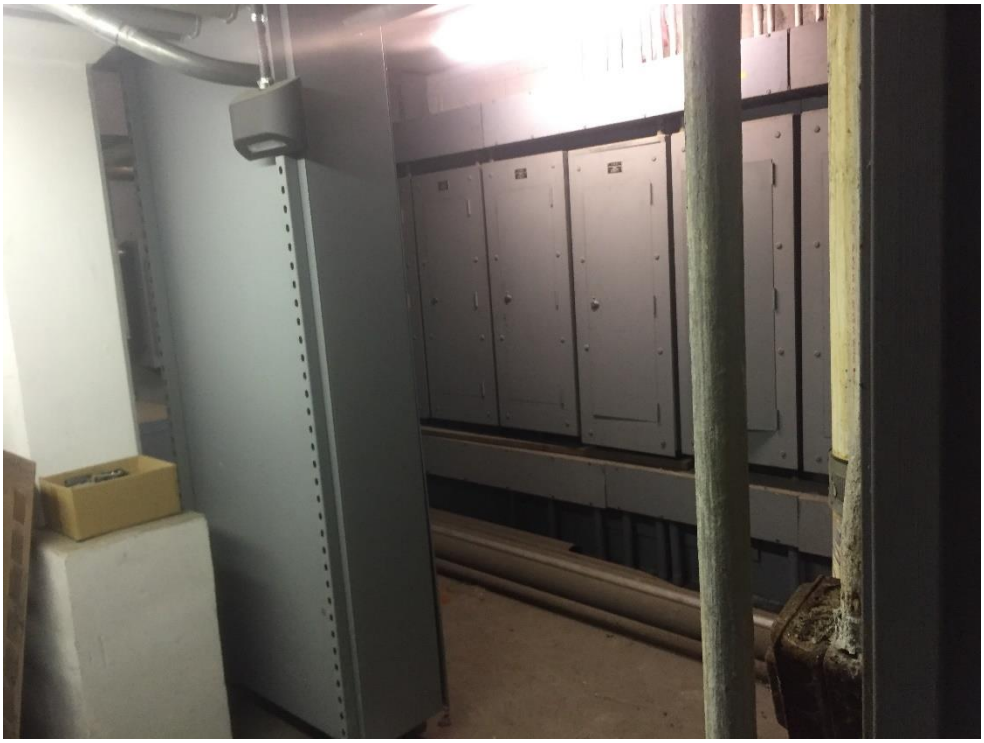
AC Unit Sample

AC Unit

Air Vent

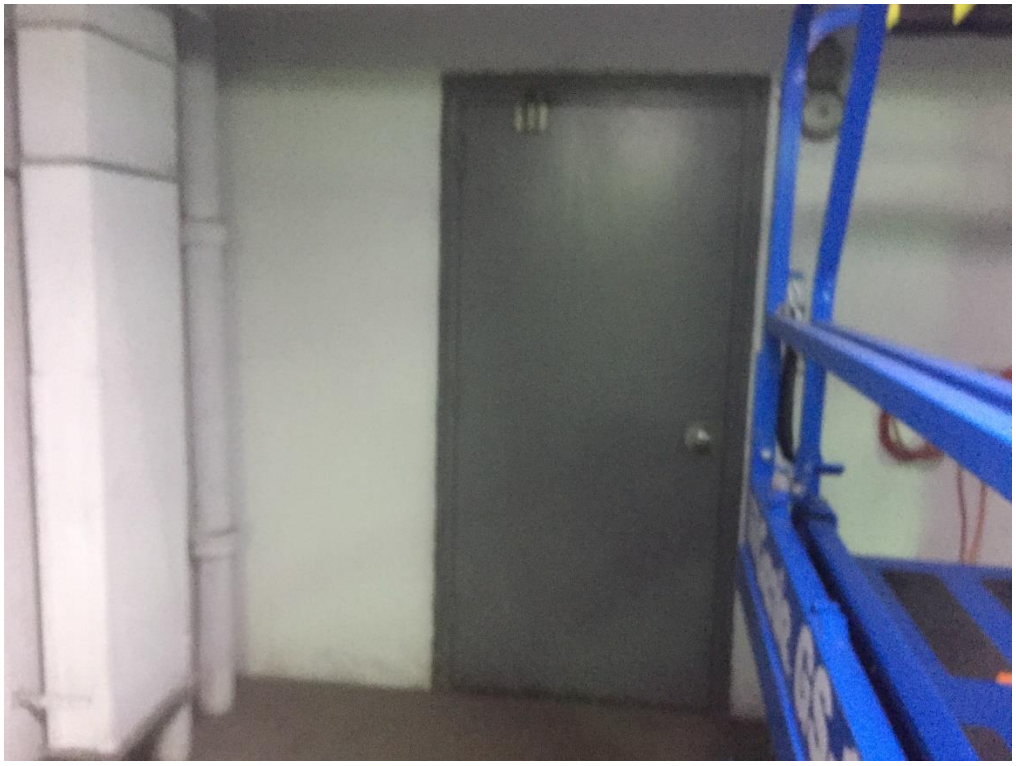


B-Area



Electrical Room

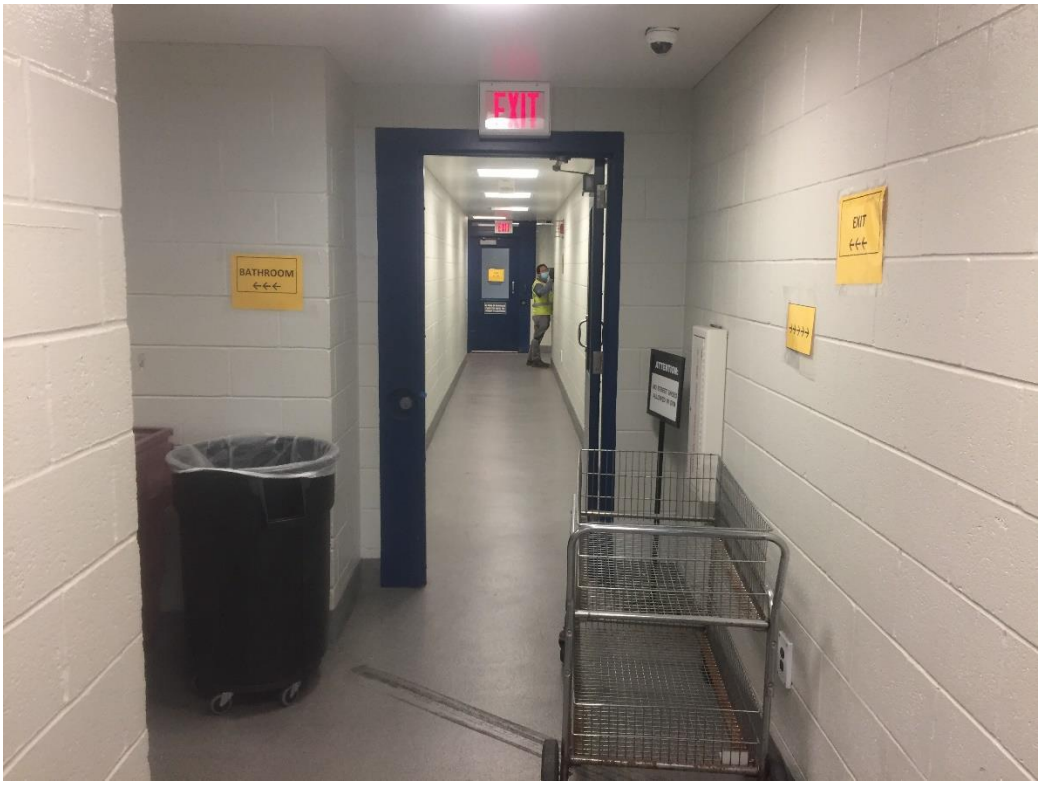
Elevator Room



Not Access

Sprinkler Room Fittings

Wall Stucco Ceiling



Back Hallway

Bridge Interior – No Access

Bridge

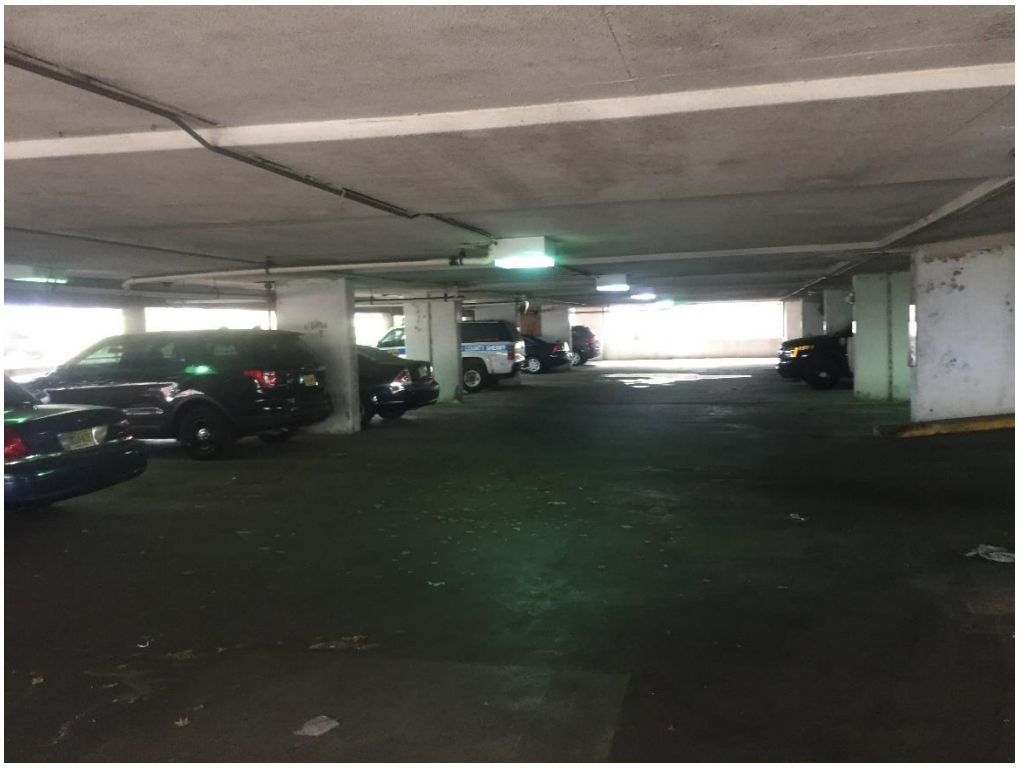
Ceiling Stucco

Cell Chase Interior

Cell Chase

Concrete Decking SOFP

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

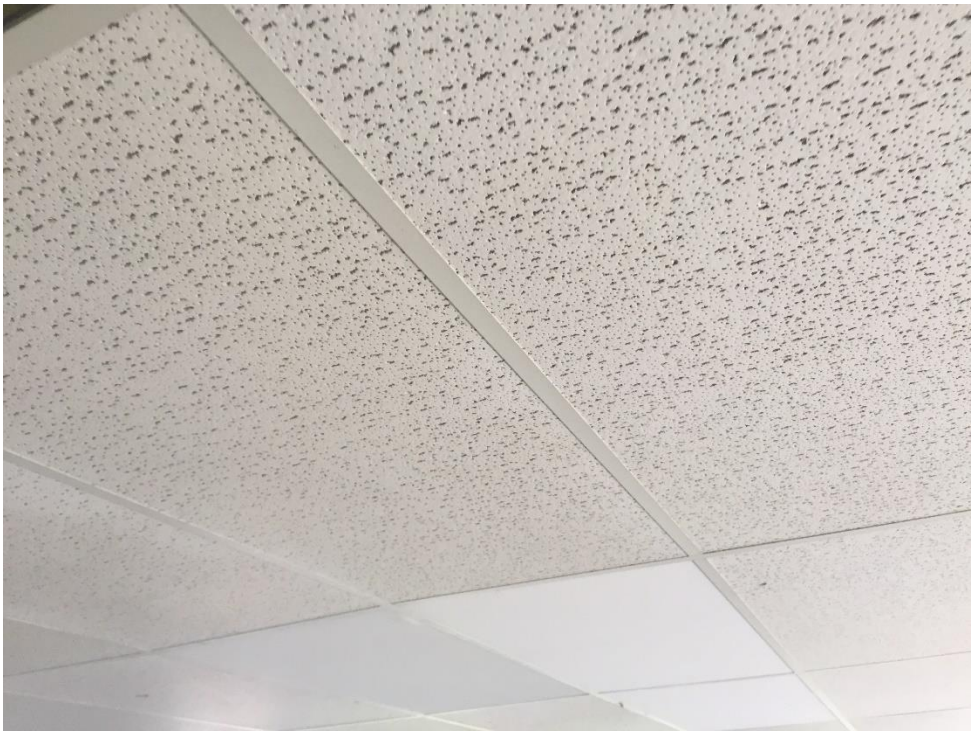


Deck

Deck

Deck

Deck



Deck Ceiling

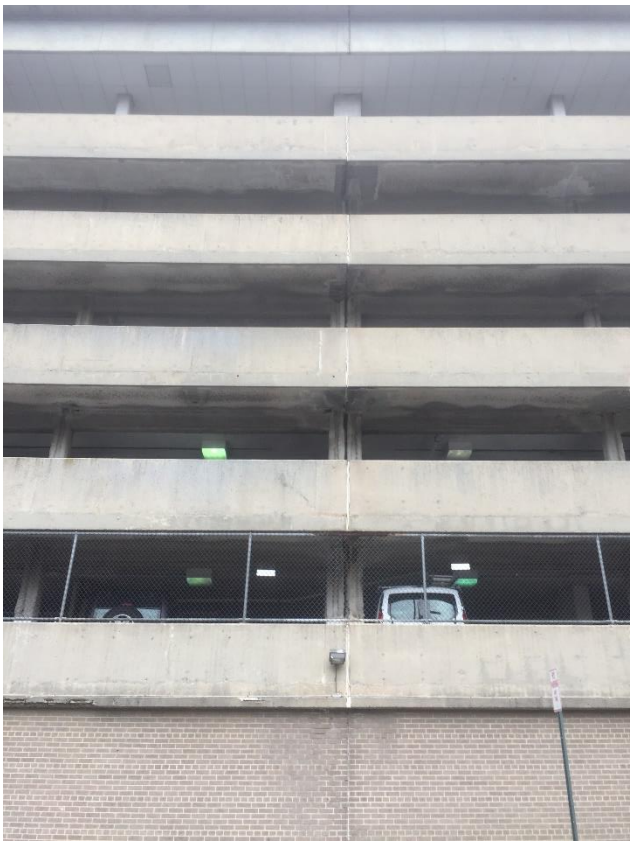
Deck

Drain Exhaust Vent

Drain

Exterior

Exterior Brick



Exterior

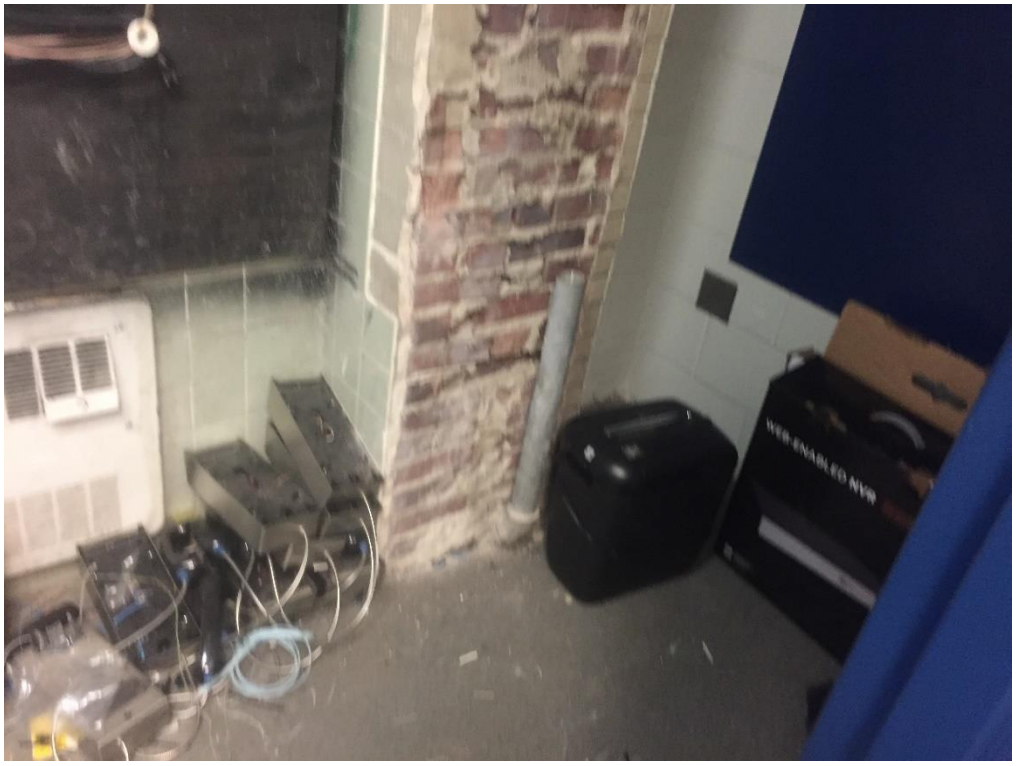
Fitting Sample

Fittings

Flashing Sample

Hallway

Interior Roof



IT Room

Main Roof

MER A

Roof Area

Roof Patching

Roof Sample

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

Roof Sample

SOFP

SOFP

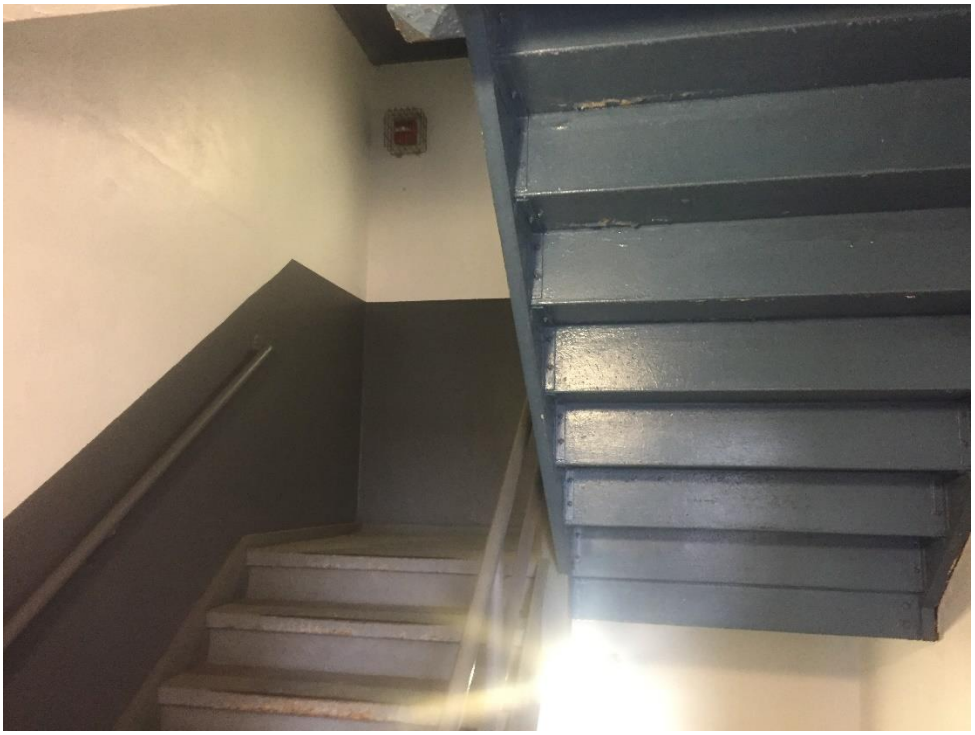
SOFP

SOFP

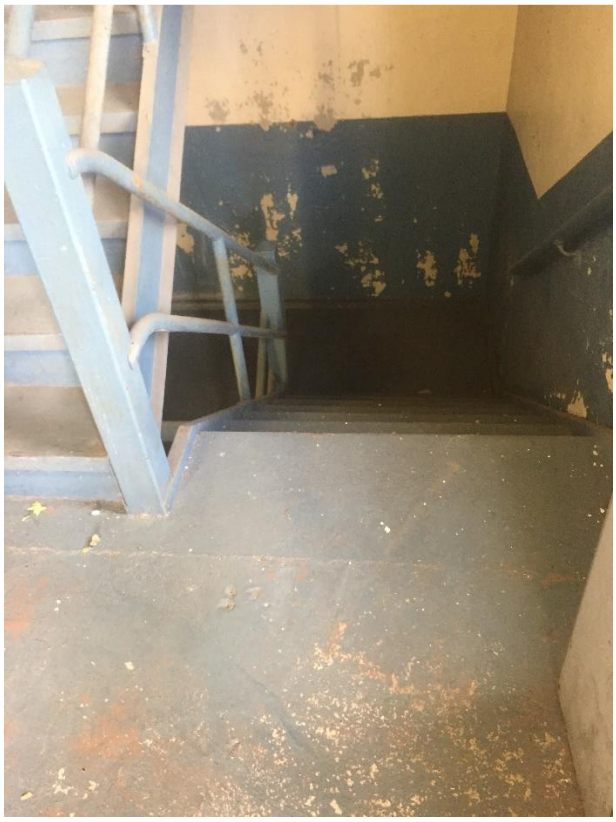
SOFP Chase

SOFP

Stair 1B



Stair 3A



Stair 6B

Stair 3B

Stair Interior

Upper Roof A Access

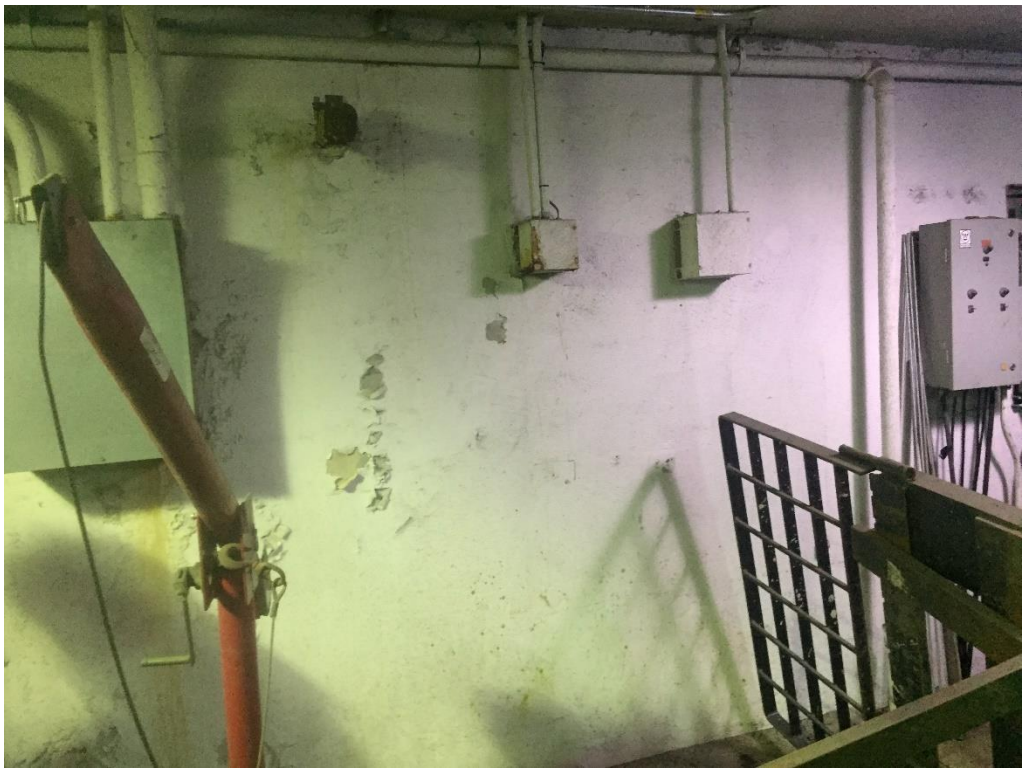
Upper Roof A Sample

Upper Roof A

Upper Roof B

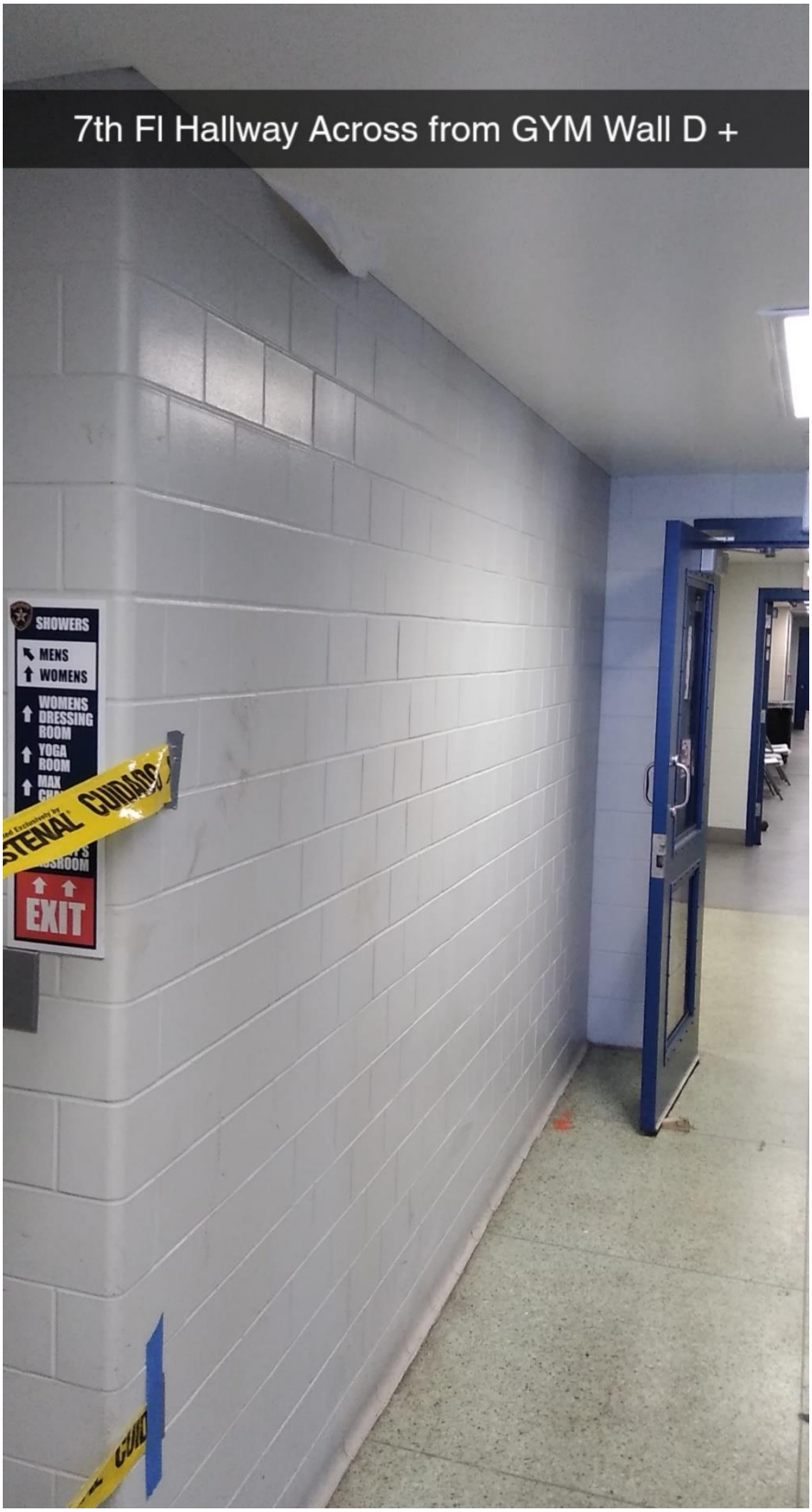
Vent Sample

Vent



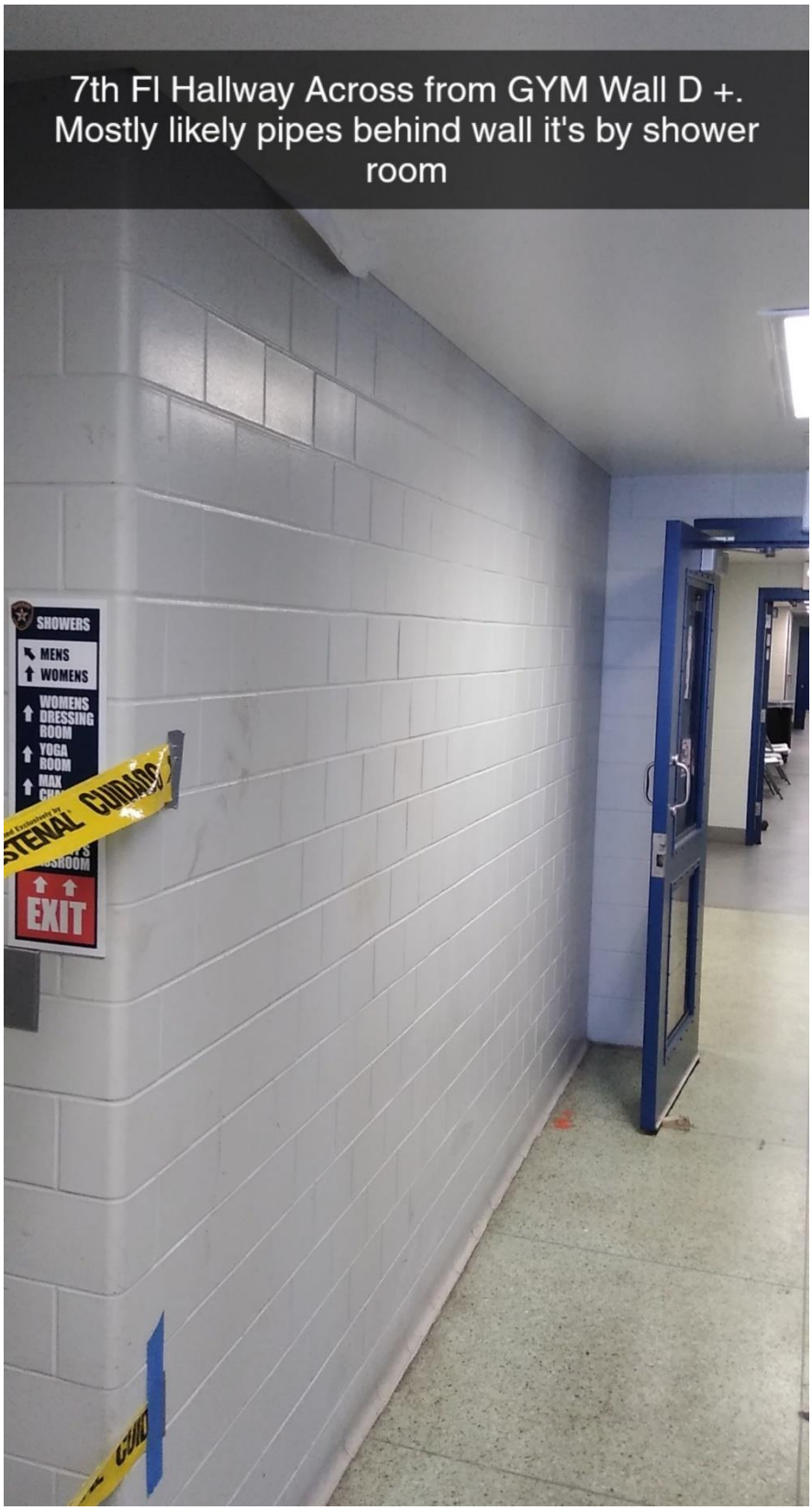
Wall Texture Stucco


Ladder & Pipe Roof Entrance +


7th Fl Hallway Across from GYM Wall D +
SHOWERS
MENS
WOMENS
WOMENS DRESSING ROOM
YOGA ROOM
EXIT

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412


OSY Valves Pump Room Pipe +
DRY SYSTEM
MAIN CONTROL
BASEMENT & SUB-BASEMENT
PUMP INFO



Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412


Pipe 7th Floor Staircase by Caldwell side


OSY Valves Pump Room Pipe +
FIRE PUMP TAMPERS

A. Asbestos (ACM)

A1. Analytical Methodology
A2. Table of Sample Results
A3. Asbestos Laboratory Analytical Reports

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

A1. Analytical Methodology:

Definitions:

ACM: asbestos containing material
RACM: regulated asbestos containing material
VCM: vermiculite containing material
TSI: thermal system insulation (pipe insulation)
SSI: surfacing material (spray-on fireproofing, plaster, etc.)
Miscellaneous finish material: sheetrock, floor tile, roofing, other
NOB: non-organically bound non-friable material (e.g. roofing, floor tile, etc.)

Friable vs. Non-friable**:**

1. A friable material is one that can be easily crumbled, pulverized, or reduced to powder by hand pressure. This characteristic of a building material is directly linked to the potential of the material to release asbestos fibers into the air.
2. Non-friable are the materials that are organically bound normally fall into this category as long as they are in good condition. Some of the materials, which would be defined as non-friable material, include floor tiles, roofing materials, mastic, etc. Non-friable ACM are categorized into two (2) categories by USEPA: Category I non-friable materials, such as resilient floor tiles, and roofing materials are not expected to become friable when disturbed. Non-friable ACM, such as laboratory table tops and transite siding/paneling, are considered to be a category II non-friable ACM.
3.

Criteria for Positive Classification as Regulated Asbestos Containing Material (RACM):

Asbestos containing material (ACM)

The EPA defines ACM as any material having an Asbestos content greater than 1%. If the analytical results for any sample of suspected material indicate that asbestos is present above a level of one percent, the building material is classified as regulated ACM (RACM) which triggers management and/or abatement, if impacted.

Vermiculite (VCM)

Related to cross-contamination in the mining industry, as well as new concerns about Amphibole minerals with crystalline structure similar to Asbestos, bulk samples found to contain greater than or equal to ten percent Vermiculite require further classification *in NYS/NYC*. Vermiculite is not currently regulated in New Jersey.

Representative Nature of All Sampling:

The purpose of bulk sampling is to characterize representative materials, not remove and test every square inch of material. The Inspector/Investigator uses a combination of EPA recommended bulk sampling criteria and professional judgment to select representative sampling locations of each suspect material type. In certain rare cases, building materials may appear to be homogeneous (e.g. plaster, roofing, etc.) but vary section to section due to patching, different installation methods floor-to-floor, and other causes. Additional testing beyond normal survey protocol can be required for these scenarios.

HOMOGENEOUS AREAS: A homogeneous area is a portion of a building/structure with similar/same installed materials such that bulk analysis results from one area can be applied in the next for the purpose of asbestos quantification.

'FIRST POSITIVE STOP': In order to reduce unnecessary survey laboratory analysis costs when samples are collected in groups of three (3) or two (2), as required by EPA sampling criteria, when the first or second sample is reported as positive in a group, then the additional samples are declared positive with no analysis.

SAMPLING FROM SLAB UP: Because older/original bottom layer materials are more likely to contain asbestos versus newer layers, materials such as floor tiles and roofing are sampled from the slab up. If a positive lower or middle layer is identified, all materials in the layered system can be declared ACM if they cannot be separated during the abatement process.

SHEETROCK JOINT COMPOUND TESTING: Since most sheetrock wallboard systems are painted, it is difficult to impossible to assess where one type of material starts and ends. EPA has published memos concerning composite sampling that were not approved by OSHA which requires discrete sampling. This agency does not recognize composite testing of joint compound for the purpose of preventing employee exposure. NYSDOL also requires separate sampling of joint compound. The PLM analysis method has been generally utilized for this material type, where samples in the trace-1% inconclusive range are also run by TEM-NOB for additional accuracy.

Non-friable asbestos samples collected are analyzed using the TEM-NOB method of analysis, as required by regulation.

Upon completion of the sampling, the samples were submitted to an accredited approved laboratory for analysis. The samples were divided into batches and analyzed by EPA Method 600/MA-82-020, Polarized Light Microscopy with dispersion staining. The percentage of each type of asbestos was determined and any remaining materials were identified. The U.S. Environmental Agency defines ACM as having an asbestos content of greater $\geq$ than 1%. If the analytical results for any sample of suspected material indicate that asbestos is present above a level of one percent, the building material is considered to contain asbestos.

1. Stereoscope Examination:

Working under a designated bulk asbestos laboratory hood, a sample is carefully poured onto the stage of the stereoscope for examination to determine if the sample is homogeneous and fibrous.

2. Slide Preparation:

A slide of each component in the sample is prepared using as little matrix material as possible. Samples are mounted on microscope slides in high dispersion refractive index liquids. For asbestos analysis, the sample is initially mounted in liquids with refractive indexes of (η) of 1.550, close to that of chrysotile asbestos. Liquids of higher refractive index may also be required for determining other asbestos forms.

3. PLM Examination:

Each slide is examined under a high quality polarized light microscope (20x-55x objective). A dispersion staining objective is also used.

The samples are first examined under plane polarizing light with the condenser set at zero. The morphology and relief of the fibers and matrix materials are observed. Next the analyzer is inserted for examination under the cross polars. Determinations are made if the fibers are isotropic or opaque with the angle of extinction noted. The condenser plate may also be inserted to produce retardation colors, depending on birefringence of the material. The sign of elongation is also determined at this time.

Refractive index is determined by matching a particular fiber with a refractive index liquid of the closest refractive index. The Becke line test is also used to cheek the refractive index. Dispersion staining is used to further characterize the components of a sample.

4. Identification of Asbestos:

Chrysotile

Chrysotile, which is the most common asbestos-form, is easily identified in liquid of refractive index 1.550 by its characteristic morphology (fibrous bundles with kinked bends) and dispersion staining colors (blue-magenta).

Amosite

Amosite is identified in 1.688 refractive index liquid by morphology (straight fibers with broomed ends) and dispersion staining colors (blue-yellow).

Crocidolite

The straight or bundled fibers of crocidolite (amphibole) are pleochroic; they appear blue-grey under plane polarized light. The fibers show negative sign of elongation and an index of refraction approaching 1.680.

Other Asbestos-Forms

Other fibrous amphiboles, which differ in refractive index from amosite, are anthophyllite

(η= 1.605), tremolite (η= 1.605), and actinolite (η= 1.680).

5. TEM/NOB Analysis:

Due to matrix interference, NJDOL requires all non-friable materials tested (i.e., floor tiles, asphalt roofing, mastics, etc.) undergo TEM (transmission electron microscopy)/NOB EPA 600/R-93/116 (non-organically bound) analysis NY ELAP 198.4 Method. This analysis method, which is conducted by an accredited independent testing laboratory, includes ashing of the sample matrix to reduce binder interference to provide a lower detection limit.

A2. Asbestos Bulk Sampling & Analysis Results of Areas Inspected:

According to EPA definition a material that contains 1% or greater asbestos content is classified as regulated ACM. Representative bulk sampling and analysis was conducted of the following:

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
1	1	Roof – Main Roof	Top Layer	Non-Friable	None Detected	None Detected
2	2	Roof – Main Roof	2nd Layer	Friable	None Detected	None Detected
3	3	Roof – Main Roof	3rd Layer	Friable	None Detected	None Detected
4	4	Roof – Main Roof	4th Layer	Friable	None Detected	None Detected
5	5	Roof – Main Roof	5th Layer	Friable	None Detected	None Detected
6	6	Roof – Main Roof	Bottom Layer	Non-Friable	None Detected	None Detected
7	1	Roof – Main Roof	Top Layer	Non-Friable	None Detected	None Detected
8	2	Roof – Main Roof	2nd Layer	Friable	None Detected	None Detected
9	3	Roof – Main Roof	3rd Layer	Friable	None Detected	None Detected
10	4	Roof – Main Roof	4th Layer	Friable	None Detected	None Detected
11	5	Roof – Main Roof	5th Layer	Friable	None Detected	None Detected
12	6	Roof – Main Roof	Bottom Layer	Non-Friable	None Detected	None Detected
13	7	Roof – Main Roof	Top Unit Flashing Material	Non-Friable	None Detected	None Detected
14	8	Roof – Main Roof	Bottom Unit Flashing Material	Friable	None Detected	None Detected
15	7	Roof – Main Roof	Unit Flashing Top	Non-Friable	None Detected	None Detected
16	8	Roof – Main Roof	Unit Flashing Bottom	Friable	None Detected	None Detected
17	9	Roof – Main Roof	Air Vent Flashing	Non-Friable	None Detected	None Detected
18	9	Roof – Main Roof	Air Vent Flashing	Non-Friable	None Detected	None Detected
19	10	Roof – Upper Roof A	Roofing Top Layer	Non-Friable	None Detected	None Detected
20	11	Roof – Upper Roof A	Roofing 2nd Layer	Friable	None Detected	None Detected
21	12	Roof – Upper Roof A	Roofing 3rd Layer	Friable	None Detected	None Detected
22	13	Roof – Upper Roof A	Roofing Bottom Layer	Non-Friable	None Detected	None Detected
23	14	Roof – Upper Roof A	Flashing	Non-Friable	None Detected	None Detected

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
24	14	Roof – Upper Roof A	Flashing	Non-Friable	None Detected	None Detected
25	15	Roof – Main Roof	Vent Flashing Top Layer	Non-Friable	None Detected	None Detected
26	16	Roof – Main Roof	Vent Flashing Bottom Layer	Non-Friable	9.10% Chrysotile	None Detected
27	15	Roof – Main Roof	Vent Flashing Top Layer	Non-Friable	None Detected	None Detected
28	16	Roof – Main Roof	Vent Flashing Bottom Layer	Non-Friable	Positive Stop	-
29	17	Roof - Main Roof Door A	Caulking Around Doors	Non-Friable	2.93% Chrysotile	None Detected
30	17	Roof – Main Roof Door B	Caulking Around Doors	Non-Friable	Positive Stop	-
31	18	Roof Upper Roof – Upper Roof A	Pitch Pocket Material	Non-Friable	None Detected	None Detected
32	18	Roof – Upper Roof A	Pitch Pocket Material	Non-Friable	None Detected	None Detected
33	19	Roof – Main Roof A	Caulking Around Material Flashing	Non-Friable	None Detected	None Detected
34	19	Roof – Main Roof B	Caulking Around Material Flashing	Non-Friable	None Detected	None Detected
35	20	Roof – Exterior Wall	Brick	Friable	None Detected	None Detected
36	21	Roof – Exterior Wall	Mortar	Friable	None Detected	None Detected
37	20	Roof – Exterior Wall	Brick	Friable	None Detected	None Detected
38	21	Roof – Exterior Wall	Mortar	Friable	None Detected	None Detected
39	22	Roof – Staircase A	Interior Brick	Friable	None Detected	None Detected
40	23	Roof - Staircase A	Interior Mortar	Friable	None Detected	None Detected
41	22	Roof - Staircase A	Interior Brick	Friable	None Detected	None Detected
42	23	Roof - Staircase A	Interior Mortar	Friable	None Detected	None Detected
43	22	Roof - Staircase B	Interior Brick	Friable	None Detected	None Detected
44	23	Roof - Staircase B	Interior Mortar	Friable	None Detected	None Detected
45	24	7th Floor – IT Closet	Brick	Friable	None Detected	None Detected
46	25	7th Floor – IT Closet	Mortar	Friable	None Detected	None Detected
47	24	7th Floor – IT Closet	Brick	Friable	None Detected	None Detected
48	25	7th Floor – IT Closet	Mortar	Friable	None Detected	None Detected
49	26	7th Floor – IT Closet	Thinset	Friable	Trace Chrysotile	None Detected

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
50	27	7th Floor – IT Closet	Grout	Friable	None Detected	None Detected
51	28	7th Floor – Room #1	SOFP Green	Friable	None Detected	None Detected
52	28	7th Floor – Room #1	SOFP Green	Friable	None Detected	None Detected
53	28	7th Floor – Room IT Closet	SOFP Green	Friable	None Detected	None Detected
54	29	7th Floor – Room #1	SOFP Gray	Friable	None Detected	None Detected
55	29	7th Floor – IT Closet	SOFP Gray	Friable	None Detected	None Detected
56	29	7th Floor – IT Closet	SOFP Gray	Friable	None Detected	None Detected
57	30	Roof – MER Stair A	Fitting	Friable	51.25% Chrysotile	None Detected
58	30	Roof – MER Stair A	Fitting	Friable	Positive Stop	-
59	31	7th Floor – Hallway	2'x2' CT	Friable	None Detected	None Detected
60	31	7th Floor - Office	2'x'2' CT	Friable	None Detected	None Detected
61	32	7th Floor – Room #1	Drywall	Friable	None Detected	None Detected
62	33	7th Floor – Room #1	Joint Compound	Friable	None Detected	None Detected
63	32	7th Floor – Room #1	Drywall	Friable	None Detected	None Detected
64	33	7th Floor – Room #1	Joint Compound	Friable	None Detected	None Detected
65	32	7th Floor – Room #1	Drywall	Friable	None Detected	None Detected
66	33	7th Floor – Room #1	Joint Compound	Friable	None Detected	None Detected
67	34	7th Floor – Room #3	Flooring Epoxy	Friable	None Detected	None Detected
68	34	7th Floor – Hallway	Flooring Epoxy	Friable	None Detected	None Detected
69	34	7th Floor – Back Hallway	Flooring Epoxy	Friable	None Detected	None Detected
70	26	7th Floor - Bathroom	Thinset	Friable	None Detected	None Detected
71	27	7th Floor – Bathroom	Grout	Friable	None Detected	None Detected
72	26	7th Floor – Bathroom	Thinset	Friable	None Detected	None Detected
73	27	7th Floor - Bathroom	Grout	Friable	None Detected	None Detected
74	35	7th Floor – Hallway	CMU Glaze	Friable	None Detected	None Detected
75	36	7th Floor – Hallway	Mortar	Friable	None Detected	None Detected

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
76	35	7th Floor – Cell A	CMU Glaze	Friable	None Detected	None Detected
77	36	7th Floor – Cell A	Mortar	Friable	None Detected	None Detected
78	35	7th Floor – Cell C	CMU Glaze	Friable	None Detected	None Detected
79	36	7th Floor – Cell C	Mortar	Friable	None Detected	None Detected
80	35	7th Floor – Cell #1	CMU Glaze	Friable	None Detected	None Detected
81	36	7th Floor – Cell #1	Mortar	Friable	None Detected	None Detected
82	35	7th Floor – Chase K	CMU Glaze	Friable	None Detected	None Detected
83	36	7th Floor – Chase K	Mortar	Non-Friable	None Detected	None Detected
84	37	7th Floor - Office	12"x12" F.T.	Non-Friable	None Detected	None Detected
85	38	7th Floor – Office	Mastic Under Floor Tile	Non-Friable	None Detected	None Detected
86	37	7th Floor – Office	12"x12" F.T.	Non-Friable	None Detected	None Detected
87	38	7th Floor – Office	Mastic Under F.T.	Non-Friable	None Detected	None Detected
88	39	7th Floor – Cell	Ceiling Drywall	Friable	None Detected	None Detected
89	40	7th Floor – Cell	Joint Compound	Friable	None Detected	None Detected
90	39	7th Floor – Office	Ceiling Drywall	Friable	None Detected	None Detected
91	40	7th Floor – Office	Joint Compound	Friable	None Detected	None Detected
92	41	7th Floor – Cell Chase	SOFP White	Friable	86.00% Chrysotile	None Detected
93	41	7th Floor – Cell Chase	SOFP White	Friable	Positive Stop	-
94	41	7th Floor – Cell Chase	SOFP White	Friable	Positive Stop	-
95	42	6th Floor – Parking Deck	2'x4' Ceiling Tile	Friable	None Detected	None Detected
96	42	6th Floor – Parking Deck	2'x4' Ceiling Tile	Friable	None Detected	None Detected
97	42	6th Floor – Parking Deck	2'x4' Ceiling Tile	Friable	None Detected	None Detected
98	43	5th Floor – Parking Deck	Ceiling Texture/Stucco	Friable	2.75% Chrysotile, Trace Amosite	None Detected
99	44	5th Floor – Parking Deck	SOFP I Beam/Column	Friable	None Detected	None Detected
100	45	5th Floor – Parking Deck	Brick Expansion Joint	Non-Friable	1.54% Chrysotile	None Detected

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
101	46	5th Floor – Parking Deck	Concrete Decking	Friable	None Detected	None Detected
102	47	5th Floor – Parking Deck	Concrete Walls Expansion Joint	Non-Friable	None Detected	None Detected
103	48	5th Floor – Parking Deck	Expansion Joint White	Non-Friable	None Detected	None Detected
104	46	4th Floor – Parking Deck	Concrete Decking	Friable	None Detected	None Detected
105	43	4th Floor – Parking Deck	Ceiling Texture/Stucco	Friable	Positive Stop	-
106	44	4th Floor – Parking Deck	SOFP I Beam/Column	Friable	None Detected	None Detected
107	45	4th Floor – Parking Deck	Brick Expansion Joint	Non-Friable	Positive Stop	-
108	47	4th Floor – Parking Deck	Concrete Walls Expansion Joint	Non-Friable	None Detected	None Detected
109	48	4th Floor – Parking Deck	Expansion Joint White	Non-Friable	None Detected	None Detected
110	46	3rd Floor – Parking Deck	Concrete Decking	Friable	None Detected	None Detected
111	43	3rd Floor – Parking Deck	Ceiling Texture/Stucco	Friable	Positive Stop	-
112	44	3rd Floor – Parking Deck	SOFP I Beam/Column	Friable	None Detected	None Detected
113	45	3rd Floor – Parking Deck	Brick Expansion Joint	Non-Friable	Positive Stop	-
114	46	2nd Floor – Parking Deck	Concrete Decking	Friable	None Detected	None Detected
115	43	2nd Floor – Parking Deck	Ceiling Texture/Stucco	Friable	Positive Stop	-
116	44	2nd Floor – Parking Deck	SOFP I Beam/Column	Friable	None Detected	None Detected
117	45	2nd Floor – Parking Deck	Brick Expansion Joint	Non-Friable	Positive Stop	-
118	46	1st Floor – Parking Deck	Concrete Decking	Friable	None Detected	None Detected
119	43	1st Floor – Parking Deck	Ceiling Texture/Stucco	Friable	Positive Stop	-
120	44	1st Floor – Parking Deck	SOFP I Beam/Column	Friable	None Detected	None Detected
121	20	1st Floor – Exterior Building	Brick	Friable	None Detected	None Detected
122	21	1st Floor – Exterior Building	Mortar	Friable	None Detected	None Detected
123	20	1st Floor – Exterior Building	Brick	Friable	None Detected	None Detected
124	21	1st Floor – Exterior Building	Mortar	Friable	None Detected	None Detected
125	20	1st Floor – Exterior Building	Brick	Friable	None Detected	None Detected
126	21	1st Floor – Exterior Building	Mortar	Friable	None Detected	None Detected
127	49	Basement – Elevator Room	Fitting	Friable	67.75% Chrysotile	None Detected

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
128	50	Basement – Parking Deck	Wall Texture/Stucco	Friable	2.75% Chrysotile	None Detected
129	50	Basement – Parking Deck	Wall Texture/Stucco	Friable	Positive Stop	-
130	50	Basement – Parking Deck	Wall Texture/Stucco	Friable	Positive Stop	-

A3. Asbestos Laboratory Analytical Reports:

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020

TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-02	93188	ROOF MAIN ROOF	2ND LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-03	93189	ROOF MAIN ROOF	3RD LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-04	93190	ROOF MAIN ROOF	4TH LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-05	93191	ROOF MAIN ROOF	5TH LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-08	93192	ROOF MAIN ROOF	2ND LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-09	93193	ROOF MAIN ROOF	3RD LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-10	93194	ROOF MAIN ROOF	4TH LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-11	93195	ROOF MAIN ROOF	5TH LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-14	93196	ROOF MAIN ROOF	BOTTOM UNIT FLASHING MAT	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-16	93197	ROOF MAIN ROOF	BOTTOM UNIT FLASHING MAT	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight
(2.) results relate to items tested only
(3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-20	93198	ROOF UPPER ROOF A	ROOFING 2ND LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-21	93199	ROOF UPPER ROOF A	ROOFING 3RD LAYER	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	CELLULOSE-80%, OTHER-20%	NO	ND	
10-01-PSS-35	93200	ROOF EXTERIOR WALL	BRICK	HETEROGENEOUS BROWN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-36	93201	ROOF EXTERIOR WALL	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-37	93202	ROOF EXTERIOR WALL	BRICK	HETEROGENEOUS BROWN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-38	93203	ROOF EXTERIOR WALL	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-39	93204	ROOF STAIRCASE A	INTERIOR BRICK	HETEROGENEOUS RED NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-40	93205	ROOF STAIRCASE A	INTERIOR MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-41	93206	ROOF STAIRCASE A	INTERIOR BRICK	HETEROGENEOUS RED NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-42	93207	ROOF STAIRCASE A	INTERIOR MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory
(2.) results relate to items tested only
***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**
ND = None Detected

Report Approved By: _____
Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

(NYS DOH ELAP ID# 10504)

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-43	93208	ROOF STAIRCASE B	INTERIOR BRICK	HETEROGENEOUS RED NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-44	93209	ROOF STAIRCASE B	INTERIOR MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	ND	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-45	93210	7TH FLOOR IT CLOSET	BRICK	HETEROGENEOUS RED NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-46	93211	7TH FLOOR IT CLOSET	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-47	93212	7TH FLOOR IT CLOSET	BRICK	HETEROGENEOUS RED NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-48	93213	7TH FLOOR IT CLOSET	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-49	93214	7TH FLOOR IT CLOSET	THINSET	HETEROGENEOUS GRAY NON-FIBROUS	TRACE	TRACE	CHRY	CARBONATES-35%, QUARTZ-65%	NO	ND	
10-01-PSS-50	93215	7TH FLOOR IT CLOSET	GROUT	HETEROGENEOUS WHITE NON-FIBROUS	NO	ND	NA	CARBONATES-99%, OTHER-1%	NO	ND	
10-01-PSS-51	93216	7TH FLOOR ROOM #1	SOFP GREEN	HETEROGENEOUS BLUE FIBROUS	NO	ND	NA	FIBERGLASS-5%, CELLULOSE-15%, CARBONATES-80%	NO	ND	
10-01-PSS-52	93217	7TH FLOOR ROOM #1	SOFP GREEN	HETEROGENEOUS BLUE FIBROUS	NO	ND	NA	FIBERGLASS-5%, CELLULOSE-15%, CARBONATES-80%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory
(2.) results relate to items tested only
***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**
ND = None Detected

Page 3 of 10

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

(NYS DOH ELAP ID# 10504)

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020

TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-53	93218	7TH FLOOR IT CLOSET	SOFP GREEN	HETEROGENEOUS BLUE FIBROUS	NO	ND	NA	FIBERGLASS-5%, CELLULOSE-15%, CARBONATES-80%	NO	ND	
10-01-PSS-54	93219	7TH FLOOR ROOM #1	SOFP GRAY	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-80%	NO	ND	
10-01-PSS-55	93220	7TH FLOOR IT CLOSET	SOFP GRAY	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-80%	NO	ND	
10-01-PSS-56	93221	7TH FLOOR IT CLOSET	SOFP GRAY	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-80%	NO	ND	
10-01-PSS-57	93222	ROOF MER STAIR A	FITTING	HETEROGENEOUS WHITE FIBROUS	YES	51.25%	CHRY	CARBONATES-45%, OTHER-3.75%	NO	ND	
10-01-PSS-58	93223	ROOF MER STAIR A	FITTING	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-59	93224	7TH FLOOR HALLWAY	2' X 2' CT	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-60	93225	7TH FLOOR OFFICE	2' X 2' CT	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-61	93226	7TH FLOOR ROOM #1	DRYWALL	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-62	93227	7TH FLOOR ROOM #1	JOINT COMPOUND	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CARBONATES-99%, OTHER-1%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

(2.) results relate to items tested only

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-63	93228	7TH FLOOR ROOM #1	DRYWALL	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-2-%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-64	93229	7TH FLOOR ROOM #1	JOINT COMPOUND	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-65	93230	7TH FLOOR ROOM #1	DRYWALL	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-20%, CARBONATES-10%, PERLITE-70%	NO	ND	
10-01-PSS-66	93231	7TH FLOOR ROOM #1	JOINT COMPOUND	HETEROGENEOUS WHITE NON-FIBROUS	NO	ND	NA	CARBONATES-99%, OTHER-1%	NO	ND	
10-01-PSS-67	93232	7TH FLOOR ROOM #3	FLOORING EPOXY	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	QUARTZ-90%, OTHER-10%	NO	ND	
10-01-PSS-68	93233	7TH FLOOR HALLWAY	FLOORING EPOXY	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	QUARTZ-90%, OTHER-10%	NO	ND	
10-01-PSS-69	93234	7TH FLOOR BACK HALLWAY	FLOORING EPOXY	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	QUARTZ-90%, OTHER-10%	NO	ND	
10-01-PSS-70	93235	7TH FLOOR BATHROOM	THINSET	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-35%, QUARTZ-65%	NO	ND	
10-01-PSS-71	93236	7TH FLOOR BATHROOM	GROUT	HETEROGENEOUS WHITE NON-FIBROUS	NO	ND	NA	CARBONATES-90%, QUARTZ-5%, OTHER-5%	NO	ND	
10-01-PSS-72	93237	7TH FLOOR BATHROOM	THINSET	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-35%, QUARTZ-65%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory
(2.) results relate to items tested only

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020

TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-73	93238	7TH FLOOR BATHROOM	GROUT	HETEROGENEOUS WHITE NON-FIBROUS	NO	ND	NA	CARBONATES-90%, QUARTZ-5%, OTHER-5%	NO	ND	
10-01-PSS-74	93239	7TH FLOOR HALLWAY	CMU GLAZED	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-75	93240	7TH FLOOR HALLWAY	MORTAR	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-25%, QUARTZ-75%	NO	ND	
10-01-PSS-76	93241	7TH FLOOR CELL A	CMU GLAZED	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-77	93242	7TH FLOOR CELL A	MORTAR	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-25%, QUARTZ-75%	NO	ND	
10-01-PSS-78	93243	7TH FLOOR CELL C	CMU GLAZED	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-79	93244	7TH FLOOR CELL C	MORTAR	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-25%, QUARTZ-75%	NO	ND	
10-01-PSS-80	93245	7TH FLOOR CELL #1	CMU GLAZED	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-81	93246	7TH FLOOR CELL #1	MORTAR	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-40%, QUARTZ-60%	NO	ND	
10-01-PSS-82	93247	7TH FLOOR CHASE K	CMU GLAZED	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

(2.) results relate to items tested only

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-83	93248	7TH FLOOR CHASE X	MORTAR	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-40%, QUARTZ-60%	NO	ND	
10-01-PSS-88	93249	7TH FLOOR CELL	CEILING DRYWALL	HETEROGENEOUS BROWN FIBROUS	NO	ND	NA	CELLULOSE-90%, OTHER-10%	NO	ND	
10-01-PSS-89	93250	7TH FLOOR CELL	JOINT COMPOUND	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CELLULOSE-80%, CARBONATES-20%	NO	ND	
10-01-PSS-90	93251	7TH FLOOR OFFICE	CEILING DRYWALL	HETEROGENEOUS BROWN FIBROUS	NO	ND	NA	CELLULOSE-90%, OTHER-10%	NO	ND	
10-01-PSS-91	93252	7TH FLOOR OFFICE	JOINT COMPOUND	HETEROGENEOUS WHITE FIBROUS	NO	ND	NA	CARBONATES-99%, OTHER-1%	NO	ND	
10-01-PSS-92	93253	7TH FLOOR CELL CHASE	SOFP WHITE	HETEROGENEOUS WHITE FIBROUS	YES	85.00%	CHRY	OTHER-14%	NO	ND	
10-01-PSS-93	93254	7TH FLOOR CELL CHASE	SOFP WHITE	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-94	93255	7TH FLOOR CELL CHASE	SOFP WHITE	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-95	93256	6TH FLOOR PARKING DECK	2' X 4' CEILING TILE	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	MIN.WOOL-90%, OTHER-10%	NO	ND	
10-01-PSS-96	93257	6TH FLOOR PARKING DECK	2' X 4' CEILING TILE	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	MIN.WOOL-90%, OTHER-10%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight
(2.) results relate to items tested only
(3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020

TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-07	93258	6TH FLOOR PARKING DECK	2' X 4' CEILING TILE	HETEROGENEOUS GRAY FIBROUS	NO	ND	NA	MIN.WOOL-90%, OTHER-10%	NO	ND	
10-01-PSS-08	93259	5TH FLOOR PARKING DECK	CEILING TEXTURE / STUCCO	HETEROGENEOUS WHITE NON-FIBROUS	YES	2.75%	AMOS-TRACE CHRY-2.75%	CARBONATES-95%, OTHER-2.25%	NO	ND	
10-01-PSS-09	93260	5TH FLOOR PARKING DECK	SOFP I.BEAM / COLUMN	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	FIBERGLASS-2%, CELLULOSE-15%, CARBONATES-80%, OTHER-3%	NO	ND	
10-01-PSS-101	93261	5TH FLOOR PARKING DECK	CONCRETE DECKING	HETERGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-104	93262	4TH FLOOR PARKING DECK	CONCRETE WALLS EXPANSION JOINT	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-105	93263	4TH FLOOR PARKING DECK	CEILING TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-106	93264	4TH FLOOR PARKING DECK	SOFP I. BEAM / COLUMN	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	FIBERGLASS-2%, CELLULOSE-15%, CARBONATES-80%, OTHER-3%	NO	ND	
10-01-PSS-110	93265	3RD FLOOR PARKING DECK	CONCRETE DECKING	HETEROGENEOUS TAN NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-111	93266	3RD FLOOR PARKING DECK	CEILING TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-112	93267	3RD FLOOR PARKING DECK	SOFP I. BEAM / COLUMN	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	FIBERGLASS-2%, CELLULOSE-15%, CARBONATES-80%, OTHER-3%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

(2.) results relate to items tested only

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

BULK ASBESTOS LABORATORY ANALYSIS REPORT

(NYS DOH ELAP ID# 10504)

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: **EPA600/M4/82/020**
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? (YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-114	93268	2ND FLOOR PARKING DECK	CONCRETE DECKING	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-60%, QUARTZ-40%	NO	ND	
10-01-PSS-115	93269	2ND FLOOR PARKING DECK	CEILING TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-116	93270	2ND FLOOR PARKING DECK	SOFP I. BEAM / COLUMN	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	FIBEROLASS-2%, CELLULOSE-15%, CARBONATES-80%, OTHER-3%	NO	ND	
10-01-PSS-118	93271	1ST FLOOR PARKING DECK	CONCRETE DECKING	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-119	93272	1ST FLOOR PARKING DECK	CEILING TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-120	93273	1ST FLOOR PARKING DECK	SOFP I. BEAM / COLUMN	HETEROGENEOUS TAN FIBROUS	NO	ND	NA	FIBERGLASS-2%, CELLULOSE-15%, CARBONATES-80%, OTHER-3%	NO	ND	
10-01-PSS-121	93274	1ST FLOOR EXTERIOR BUILDING	BRICK	HETEROGENEOUS BROWN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-122	93275	1ST FLOOR EXTERIOR BUILDING	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-123	93276	1ST FLOOR EXTERIOR BUILDING	BRICK	HETEROGENEOUS BROWN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-124	93277	1ST FLOOR EXTERIOR BUILDING	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-20%, QUARTZ-80%	NO	ND	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory
(2.) results relate to items tested only
***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**
ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

BULK ASBESTOS LABORATORY ANALYSIS REPORT

[NYS DOH ELAP ID# 10504]

CLIENT NAME: PAULUS, SOKOLOWSKI & SARTOR, LLC
ATTN: JOHN BOLAN
67B MOUNTAIN BOULEVARD EXTENSION
WARREN, NJ 07059

PROJECT/AREA: UNION COUNTRY CALDWELL & ELIZABETHTOWN PARKING DECK
ELIZABETHTOWN PLAZA & CALDWELL PLACE
ELIZABETH, NJ 07201

DATE SAMPLED: 10/1/2020
DATE RECEIVED: 10/2/2020
DATE ANALYZED: 10/2/2020
DATE OF REPORT: 10/7/2020

PROJECT #: 20-1205
ANALYST: TG
TEST REQUESTED: BULK ASBESTOS BY PLM
METHOD #: EPA600/M4/82/020
TEM-NOB ANALYSIS REQUIRED TO CONFIRM NEGATIVE PLM ANALYSIS IN NY/NJ (EPA/600/M4/82/020)

SAMPLE ID NO	LAB ID NO	SAMPLE LOCATION ROOM/AREA	MATERIAL FIELD DESCRIPTION	MATERIAL LAB DESCRIPTION	ASBESTOS DETECTED? (YES/NO)	%ASBESTOS DETECTED	TYPE OF ASBESTOS DETECTED	PREDOMINANT NON-ASBESTOS COMPONENTS	VERMICULITE DETECTED? YES/NO)	%VERMICULITE DETECTED	COMMENTS
10-01-PSS-125	93278	1ST FLOOR EXTERIOR BUILDING	BRICK	HETEROGENEOUS BROWN NON-FIBROUS	NO	ND	NA	QUARTZ-99%, OTHER-1%	NO	ND	
10-01-PSS-126	93279	1ST FLOOR EXTERIOR BUILDING	MORTAR	HETEROGENEOUS GRAY NON-FIBROUS	NO	ND	NA	CARBONATES-50%, QUARTZ-50%	NO	ND	
10-01-PSS-127	93280	BASEMENT ELEVATOR ROOM	FITTING	HETEROGENEOUS WHITE FIBROUS	YES	67.75%	CHRY	OTHER-32.25%	NO	ND	
10-01-PSS-128	93281	BASEMENT PARKING DECK	WALL TEXTURE / STUCCO	HETEROGENEOUS WHITE NON-FIBROUS	YES	2.75%	CHRY	CARBONATES-95%, OTHER-2.25%	NO	ND	
10-01-PSS-129	93282	BASEMENT PARKING DECK	WALL TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	
10-01-PSS-130	93283	BASEMENT PARKING DECK	WALL TEXTURE / STUCCO	POSITIVE STOP	-	-	-	POSTIVE STOP	-	-	

NOTES: (1.) uncertainty associated with test method = +/- 0.5% by weight (3.) lab reports shall not be reproduced except in full, without written approval of the laboratory

(2.) results relate to items tested only

***ANALYTICAL RESULTS RELATE TO THE SAMPLE(S) AS RECEIVED BY THE LABORATORY**

ND = None Detected

Report Approved By: _____

Laboratory Director or Approved Representative

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street, South Hackensack, NJ 07606 Tel: (201) 489 8700

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606 | **Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205

Laboratory ID: 20-10-015 | **Date of Report:** 10/06/20 | **Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
1	A	WH	E			Roof, Main Roof, Top Layer				35.96	*		NAD		NAD
	B	1	F												
20-10-015-01	C	198.4	G												
	D		H												
6	A	BK	E			Roof, Main Roof, Bottom Layer				0.84	*		NAD		NAD
	B	1	F												
20-10-015-02	C	198.4	G												
	D		H												
7	A	WH	E			Roof, Main Roof, Top Layer				34.47	*		NAD		NAD
	B	1	F												
20-10-015-03	C	198.4	G												
	D		H												
12	A	BK	E			Roof, Main Roof, Bottom Layer				1.04	*		NAD		NAD
	B	1	F												
20-10-015-04	C	198.4	G												
	D		H												
13	A	WH/BK	E			Roof, Main Roof, Top Unit Flashing Mat.				37.19	*		NAD		NAD
	B	1	F												
20-10-015-05	C	198.4	G												
	D		H												
15	A	WH/BK	E			Roof, Main Roof, Unit Flashing Top				19.86	*		NAD		NAD
	B	1	F												
20-10-015-06	C	198.4	G												
	D		H												

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606	**Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205
Laboratory ID: 20-10-015 **Date of Report:** 10/06/20	**Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
17	A	WH/BK	E			Roof, Main Roof, Air Vent Flashing				28.90	*		NAD		NAD
	B	1	F												
20-10-015-07	C	198.4	G												
	D		H												
18	A	WH/BK	E			Roof, Main Roof, Air Vent Flashing				34.58	*		NAD		NAD
	B	1	F												
20-10-015-08	C	198.4	G												
	D		H												
19	A	WH/BK	E			Roof, Upper Roof A, Roofing Top Layer				36.52	*		NAD		NAD
	B	1	F												
20-10-015-09	C	198.4	G												
	D		H												
22	A	BK	E			Roof, Upper Roof A, Roofing Bottom Layer				2.46	*		NAD		NAD
	B	1	F												
20-10-015-10	C	198.4	G												
	D		H												
23	A	WH/BK	E			Roof, Upper Roof A, Flashing				37.14	*		NAD		NAD
	B	1	F												
20-10-015-11	C	198.4	G												
	D		H												
24	A	WH/BK	E			Roof, Upper Roof A, Flashing				36.02	*		NAD		NAD
	B	1	F												
20-10-015-12	C	198.4	G												
	D		H												

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606 | **Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205

Laboratory ID: 20-10-015 | **Date of Report:** 10/06/20 | **Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
25	A	WH/BK	E			Roof, Main Roof, Vent Flashing Top Layer				37.86	*		NAD		NAD
	B	1	F												
20-10-015-13	C	198.4	G												
	D		H												
26	A	BK	E			Roof, Main Roof, Vent Flashing Bottom Layer				24.93	*		9.10	CH	9.10
	B	1	F												
20-10-015-14	C	198.4	G												
	D		H												
27	A	WH/BK	E			Roof, Main Roof, Vent Flashing Top Layer				37.58	*		NAD		NAD
	B	1	F												
20-10-015-15	C	198.4	G												
	D		H												
28	A		E			Roof, Main Roof, Vent Flashing Bottom Layer					*		NA		SAFP
	B		F												
20-10-015-16	C		G												
	D		H												
29	A	GR	E			Roof, Main Roof Door A, Caulking Around Doors				22.05	*		2.93	CH	2.93
	B	1	F												
20-10-015-17	C	198.4	G												
	D		H												
30	A	GR	E			Roof, Main Roof Door B, Caulking Around Doors				39.93	*		NA		SAFP
	B	1	F												
20-10-015-18	C		G												
	D		H												

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606 | **Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205

Laboratory ID: 20-10-015 | **Date of Report:** 10/06/20 | **Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
31	A	BK	E		Roof, Upper Roof A, Pitch Pocket Material				1.69	*		NAD		NAD
	B	1	F											
20-10-015-19	C	198.4	G											
	D		H											
32	A	BK	E		Roof, Upper Roof A, Pitch Pocket Material				2.62	*		NAD		NAD
	B	1	F											
20-10-015-20	C	198.4	G											
	D		H											
33	A	GR	E		Roof, Main Roof A, Caulking Around Metal Flashing				5.42	*		NAD		NAD
	B	1	F											
20-10-015-21	C	198.4	G											
	D		H											
34	A	GR	E		Roof, Main Roof B, Caulking Around Metal Flashing				5.27	*		NAD		NAD
	B	1	F											
20-10-015-22	C	198.4	G											
	D		H											
84	A	GR	E		7th Floor, Office, 12"x12" F.T.				43.75	*		NAD		NAD
	B	1	F											
20-10-015-23	C	198.4	G											
	D		H											
85	A	BK	E		7th Floor, Office, Mastic Under F.T.				12.66	*		NAD		NAD
	B	1	F											
20-10-015-24	C	198.4	G											
	D		H											

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606	**Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205
Laboratory ID: 20-10-015 **Date of Report:** 10/06/20	**Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% AII	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
86	A	GR	E		7th Floor, Office, 12"x12" F.T.				25.41	*		NAD		NAD
	B	1	F											
20-10-015-25	C	198.4	G											
	D		H											
87	A	BK	E		7th Floor, Office, Mastic Under F.T.				12.40	*		NAD		NAD
	B	1	F											
20-10-015-26	C	198.4	G											
	D		H											
100	A	GR	E		5th Floor, Parking Deck, Brick Expansion Joint				8.82	*		1.54	CH	1.54
	B	1	F											
20-10-015-27	C	198.4	G											
	D		H											
102	A	GR	E		5th Floor, Parking Deck, Concrete Walls Expansion Joint				5.79	*		NAD		NAD
	B	1	F											
20-10-015-28	C	198.4	G											
	D		H											
103	A	GR	E		5th Floor, Parking Deck, Expansion Joint White				17.45	*		NAD		NAD
	B	1	F											
20-10-015-29	C	198.4	G											
	D		H											
107	A		E		4th Floor, Parking Deck, Brick Expansion Joint					*		NA		SAFP
	B		F											
20-10-015-30	C		G											
	D		H											

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606	**Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205
Laboratory ID: 20-10-015 **Date of Report:** 10/06/20	**Date of Analysis:** 10/05/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
108	A	GR	E		4th Floor, Parking Deck, Concrete Walls Expansion Joint				6.90	*		NAD		NAD
	B	1	F											
20-10-015-31	C	198.4	G											
	D		H											
109	A	GR	E		4th Floor, Parking Deck, Expansion Joint White				54.10	*		NAD		NAD
	B	1	F											
20-10-015-32	C	198.4	G											
	D		H											
113	A	GR	E		3rd Floor, Parking Deck, Brick Expansion Joint				12.74	*		NA		SAFP
	B	1	F											
20-10-015-33	C		G											
	D		H											
117	A	GR	E		2nd Floor, Parking Deck, Brick Expansion Joint				18.40	*		NA		SAFP
	B	1	F											
20-10-015-34	C		G											
	D		H											

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** Elizabethtown Plaza & Caldwell Place, NJ **Project #:** 20-1205
Laboratory ID: 20-10-015	**Date of Report:** 10/06/20	**Date of Analysis:** 10/05/20

PLM ANALYST	PLM-NOB ANALYST	TEM-NOB ANALYST	LABORATORY DIRECTOR
		E. Louklanova	E. Dimitrakas

LABORATORY ACCREDITATION NUMBERS: NVLAP Lab Code 101958-0, NYSDOH ELAP Lab ID 10955

- Samples will be stored for sixty (60) days. LTS Inc. should be notified within this time frame for a true duplicate analysis.
- Above results relate only to samples submitted and analyzed. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. Test reports may not be reproduced except in full and with prior approval of LTS Inc.
- The liability of LTS Inc., with respect to the services charged, shall in no event exceed the amount of the invoice.
- Analytical Methodologies: EPA 600/M4-82-020 (Point Count only) and ELAP Methods 198.1, 198.4,198.6.
- NAD: No Asbestos Detected, NVD: No Vermiculite Detected, SAFP: Stopped at First Positive, CH: Chrysotile, AMOS: Amosite, TRE: Tremolite, ANTH: Anthophyllite, ACT: Actinolite, and CRO: Crocidolite.
- Stereomicroscopic Analysis: A: Color, B: Layers, C: Methodology, D: Cellulose, E: Fiberglass, F: Hair, G: Vermiculite, H: OTHER
- Color: BK: Black, BR: Brown, Dk BR: Dark Brown, Lt BR: Light Brown, R BR: Reddish Brown, GR: Gray, Dk GR: Dark Gray, Lt GR: Light Gray, BE: Beige, P: Pink, R: Red, T: Tan, WH: White, Off WH: Off White, Y: Yellow, BL: Blue, CR: Cream, GN: Green, O: Orange, Multi.: Multiple Colors

*** Not analyzed as per client's request. PLM NOB analysis is a method requirement, as indicated in Item 198.4, Section 6.3.2.2 and 4.1.3**

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

OMEGA ENVIRONMENTAL SERVICES, INC

280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

Page 1 of 13

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 10	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1/2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
01		Roof	Main Roof	01	Top Layer	NVD	5.0	6			✓		Rec'd F 125 X
02				02	2nd Layer			6	✓				
03				03	3rd Layer			6	✓				
04				04	4th Layer			6	✓				
05				05	5th Layer			6	✓				
06				06	Bottom Layer			6			✓		
07				01	Top Layer			6			✓		
08				02	2nd Layer			6	✓				
09				03	3rd Layer			6	✓				
10				04	4th Layer			6	✓				

Relinquished By & Company:	A. Fajardo 10/1/2020	Received By Company	
Date & Time		Date & Time:	10/2/20 900

Analyzed By:

Date & Time: 10/2/20 945-1330
10/3/20 805-1345

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 20	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ / /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
11		Roof	Main Roof	05	5th Layer	NVD	T.O	6	✓				
12				06	Bottom Layer			6			✓		
13				07	Top Vent Flashing Mat.			2			✓		
14				08	Bottom Vent Flashing Mastic			2	✓				
15				07	Vent Flashing Top			2			✓		
16				08	Vent Flashing Bottom			2	✓				
17				09	Air Vent Flashing			1			✓		
18				09	Air Vent Flashing			1			✓		
19			Upper Roof=A	10	Roofing Top Layer			4			✓		
20				11	2nd			4	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	
Date & Time	10/1/2020	Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 30	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
21		Roof	Upper Roof A	12	Roofing 3rd Layer	NDD	T.O	4	✓				
22		↓	↓	13	↓ Bottom	↓	↓	4			✓		
23		↓	↓	14	Flashing	↓	↓	1			✓		
24		↓	↓	14	↓	↓	↓	1			✓		
25		↓	Main Roof	15	Vent Flashing Top Layer	↓	↓	2			✓		
26		↓	↓	16	↓ Bottom	↓	↓	2			✓		
27		↓	↓	15	↓ Top	↓	↓	2			✓		
28		↓	↓	16	↓ Bottom	↓	↓	2			✓		
29		↓	Main Roof Room A	17	Caulking Around Doors	D	↓	1			✓		
30		↓	↓ Door B	17	↓ ↓	D	↓	1			✓		

Relinquished By & Company:	A. Fajardo 10/ /2020
Date & Time	
Received By Company	
Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 40	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ / /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
31		Roof Upper Roo	Upper Roof A	18	Pitch Pocket Material	N V O	5.0	1			✓		
32		Roof	↓	18	↓ ↓	↓	↓	1			✓		
33		Roof	Main Roof A	19	caulking around Metal Flashing			1			✓		
34		↓	↓ ↓ B	19	↓ ↓	↓	↓	1			✓		
35			Exterior Wall	20	Brick			1	✓				
36			↓	21	mortar			1	✓				
37				20	Brick			1	✓				
38		↓	↓	21	mortar	↓	↓	1	✓				
39			Staircase A	22	Interior Brick			1	✓				
40		↓	↓ B	23	Interior Mortar	↓	↓	1	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	
Date & Time	10/1/20	Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 50	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc.)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
41		Roof	stair Case A	22	Interior Brick	NVD	5.0	1	✓				
42			A	23	Interior Mortar			1	✓				
43			B	22	Interior Brick			1	✓				
44			B	23	Interior Mortar			1	✓				
45		7th	I & Closet	24	Brick			1	✓				
46				25	Mortar			1	✓				
47				24	Brick			1	✓				
48				25	Mortar			1	✓				
49				26	Thin set			1	✓				
50				27	~~Mortar~~ Grout			1	✓				

Relinquished By & Company:	A. Fajardo	10/1/2020	Received By Company
Date & Time			Date & Time:

Analyzed By:
Date & Time:

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 60	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
51		7TH	Room # 1	28	SOFP Green	NVD	5.0.	1	✓				Concealed
52		↓	↓	28	↓ ↓	↓	↓	1	✓				↓
53		↓	I. T closet	28	↓ ↓	↓	↓	1	✓				↓
54		↓	Room # 1	29	SOFP Grey	↓	↓	1	✓				↓
55		↓	I. T closet	29	↓ ↓	↓	↓	1	✓				↓
56		↓	↓	29	↓ ↓	↓	↓	1	✓				↓
57		Roof	MER stairFA	30	Fitting	↓	↓	1	✓				↓
58		↓	↓	30	↓	↓	↓	1	✓				↓
59		7TH	Hallway	31	2'x2'CT	↓	↓	1	✓				↓
60		↓	OFFICE	31	↓	↓	↓	1	✓				↓

Relinquished By & Company: A. Fajardo	Received By Company
Date & Time 10/1/2020	Date & Time:

Analyzed By:
Date & Time:

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 70	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1/2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
61		7th	Room #1	32	Drywall	NVD	5.0	1	✓				
62				33	Join Compound			1	✓				
63				32	Drywall			1	✓				
64				33	Join Compound			1	✓				
65				32	Drywall			1	✓				
66				33	Join Compound			1	✓				
67			Room #3	34	Flooring Epoxy			1	✓				
68			Hallway	34				1	✓				
69			Bath Hallway	34				1	✓				
70			Bathroom	26	Thinset			1	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	
Date & Time	10/1/2020	Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 80	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
71		7th	Bathroom	27	Grout	NVD	T.D	1	✓				
72		↕	↓	26	Thinset	↓	↓	1	✓				
73		↓	↓	27	Grout	↓	↓	1	✓				
74			Hallway	35	CMU Block	↓	↓	1	✓				
75			↓	36	Mortar	↓	↓	1	✓				
76			Cell A	35	CMU Block	↓	↓	1	✓				
77			↓	36	Mortar	↓	↓	1	✓				
78			Cell C	35	CMU Block	↓	↓	1	✓				
79			↓	36	Mortar	↓	↓	1	✓				
80			↓ #1	35	CMU Block	↓	↓	1	✓				

Relinquished By & Company:	A. Fajardo 10/1/2020	Received By Company	
Date & Time		Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 90	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
81		7th Fl	Cell #1	36	Mortar	NVD	5.0.	1	✓				
82			chase K	35	CMU Block			1	✓				
83			↓	36	Mortar			1	✓				
84			Office	37	12"x12" F.T.			1			✓		
85				38	Mastic under Floortile			1			✓		
86				37	12"x12" FT			1			✓		
87			↓	38	Mastic under F.T.			1			✓		
88			Cell	39	Ceiling Drywall			1	✓				
89			↓	40	Join Compound			1	✓				
90			Office	39	Ceiling Drywall			1	✓				

Relinquished By & Company:	A. Fajardo 10/1/2020	Received By Company	
Date & Time		Date & Time:	

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 10	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1/2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
91		7th	Office	40	Join Compound	NAD	5.0	1	✓				
92		↓	Call Closet	41	SOFP White	D	↓	1	✓				
93		↓	↓ ↓	41	↓ ↓	↓	↓	1	✓				
94		↓	↓ ↓	41	↓ ↓	↓	↓	1	✓				
95		6th	Parking Deck	42	2x4' ceiling tile	D	↓	1	✓				
96		↓	↓ ↓	42	↓ ↓	↓	↓	1	✓				
97		↓	↓ ↓	42	↓ ↓	↓	↓	1	✓				
98		5th	↓ ↓	43	Ceiling Texture/Stucco	D	↓	1	✓				
99		↓	Parking Deck	44	SOFP I Beam/column	↓	↓	1	✓				
100		↓	↓ ↓	45	Brick Expansion Joint	↓	↓	1	-		✓		

Relinquished By & Company:	A. Fajardo	10/1/2020	Received By Company
Date & Time			Date & Time:

Analyzed By:	
Date & Time:	

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 110	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
101		5th	Parking Deck	46	Concrete Decking	SD	TO	1	✓				
102		↓	↓	47	Concrete Walls Expansion Join	↓	↓	1			✓		
103		↓	↓	48	Expansion Join White	↓	↓	1			✓		
104		4th	Parking Deck	46	Concrete Decking			1	✓				
105				43	Ceiling Texture/Stucco			1	✓				
106				44	SOFP I Beam/Column			1	✓				
107				45	Brick Expansion Join			1			✓		
108				47	Concrete Walls Expansion Join			1			✓		
109				48	Expansion Join White			1			✓		
110		3rd	↓	46	Concrete Decking	SD	↓	1	✓				

Relinquished By & Company:	A. Fajardo	10/1/2020	Received By Company
Date & Time			Date & Time:

Analyzed By:
Date & Time:

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 120	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
111		3rd	Parking Deck	43	Ceiling Texture/stucco	SD	T.O.	1	✓				
112		↓	↓	44	SOFP I Beam/Column	↓	↓	1	✓				
113		↓	↓	45	Brick Expansion Join	↓	↓	1	↓		✓	↓	
114		2nd	↓	46	Concrete Decking	↓	↓	1	✓	↓	↓	↓	
115		↓	↓	43	Ceiling Texture/stucco	↓	↓	1	✓	↓	↓	↓	
116		↓	↓	44	SOFP I Beam/Column	↓	↓	1	✓	↓	↓	↓	
117		↓	↓	45	Brick Expansion Join	↓	↓	1	↓	↓	✓	↓	
118		1st	↓	46	Concrete Decking	↓	↓	1	✓	↓	↓	↓	
119		↓	↓	43	Ceiling Texture/stucco	↓	↓	1	✓	↓	↓	↓	
120		↓	↓	44	SOFP I Beam/Column	↓	↓	1	✓	↓	↓	↓	

Relinquished By & Company	A. Fajardo	10/1/2020	Received By Company
Date & Time			Date & Time:

Analyzed By:
Date & Time:

OMEGA ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com

Project Name:	PS&S LLC	Turnaround Time Requested:	24 Hours
Project #:	20-1205	Total # of Samples:	130
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
121		1st	Stairs Bldg	20	Brick	D	5.0	1	✓				
122				21	Mortar			1	✓				
123				20	Brick			1	✓				
124				21	Mortar			1	✓				
125				20	Brick			1	✓				
126				21	Mortar			1	✓				
127		Basement	Elevator Room	49	Fitting			1	✓				
128			~~Parking~~ Deck	50	Wall Texture/stucco			1	✓				
129				50				1	✓				
130				50				1	✓				

Relinquished By & Company:	A. Fajardo	10/1/2020	Received By Company
Date & Time			Date & Time:

Analyzed By:
Date & Time:

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

Page 1 of 13

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 10	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
01	1	Roof	Main Roof	01	Top Layer	NVD	5.0	6			✓		Row F 185 X (-) NAD
02				02	2nd Layer			6	✓				
03				03	3rd Layer			6	✓				
04				04	4th Layer			6	✓				
05				05	5th Layer			6	✓				
06	2			06	Bottom Layer			6			✓		(-) NAD
07	3			01	Top Layer			6			✓		(-) NAD
08				02	2nd Layer			6	✓				
09				03	3rd Layer			6	✓				
10				04	4th Layer			6	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	Jiarui Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

3

Analyzed By: E. Loukjanova
Date & Time: Ekl 10.5.20

OMEGA
ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested:	24 Hours
Project #:	20-1205	Total # of Samples:	20
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ / /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
11		Roof	Main Roof	05	5th Layer	NVD	T.O	6	✓				
12	4			06	Bottom Layer			6			✓		(-) NAD
13	5			07	Top Vent Flashing Mast.			2			✓		(-) NAD
14				08	Bottom Vent Flashing Mastic			2	✓				
15	6			07	Vent Flashing Top			2			✓		(-) NAD
16				08	Vent Flashing Bottom			2	✓				
17	7			09	Air Vent Flashing			1			✓		(-) NAD
18	8			09	Air Vent Flashing			1			✓		↓
19	9		Upper Roof A	10	Roofing Top Layer			4			✓		(-) NAD
20				11	↓ 2nd ↓			4	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	Jiarui Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

Analyzed By: E.Loukianova 6
Date & Time: 10.5.20

OMEGA
ENVIRONMENTAL SERVICES, INC
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

Page 3 of 13

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 30	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
21		Roof	Upper Roof A	12	Roofing 3rd Layer	NDD	5.0	4	✓				
22	10	↓	↓	13	↓ Bottom	↓	↓	4			✓		(-) NAD
23	11	↓	↓	14	Flashing	↓	↓	1			✓		(-) NAD
24	12	↓	↓	14	↓	↓	↓	1			✓		↓
25	13	↓	Main Roof	15	Front Flashing Top Layer	↓	↓	2			✓		(-) NAD
26	14	↓	↓	16	↓ Bottom	↓	↓	2			✓		(+) 9.1% CH
27	15	↓	↓	15	Top	↓	↓	2			✓		(-) NAD
28	16	↓	↓	16	↓ Bottom	↓	↓	2			✓		NA
29	17	↓	Main Roof Area A	17	Caulking around Doors	D	↓	1			✓		(+) 2.93% CH
30	18	↓	↓ Door B	17	↓	D	↓	1			✓		NA

Relinquished By & Company: A. Fajardo	Received By Company: Jiarui Pang
Date & Time:	Date & Time: 10/3/20 12:30

9

Analyzed By: E. Loukianova
Date & Time: Ehp 10.5.20

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 40	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
31	19	Roof Upper Roof	Upper Roof A	18	Pitch Pocket Material	N U D	5.0	1			✓		(-) NAD
32	20	Roof	↓	18	↓	↓	↓	1			✓		↓
33	21	Roof	Main Roof A	19	caulking around Metal Flashing	↓	↓	1			✓		(-) NAD
34	22	↓	↓ ↓ B	19	↓ ↓	↓	↓	1			✓		↓
35		↓	Exterior Wall	20	Brick	↓	↓	1	✓				
36		↓	↓	21	Mortar	↓	↓	1	✓				
37		↓	↓	20	Brick	↓	↓	1	✓				
38		↓	↓	21	Mortar	↓	↓	1	✓				
39		↓	Staircase A	22	Interior Brick	↓	↓	1	✓				
40		↓	↓ B	23	Interior Mortar	↓	↓	1	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	Jiaxin Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

4

Analyzed By: E. Loukianova
Date & Time: EL 10.5.20

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 90	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as Indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
81		7th Fl	Cell #1	36	Mortar	NVD	F.O.	1	✓				
82			Closet K	35	CMU Block			1	✓				
83			↓	36	Mortar			1	✓				
84	23		Office	37	12"x12" F.T.			1			✓		(-) ACM
85	24			38	Mastic under Floortile			1			✓		(-) ACM
86	25			37	12"x12" FT			1			✓		(-) ACM
87	26		↓	38	Mastic under F.T.	↓	↓	1			✓		(-) ACM
88			Cell	39	Ceiling Drywall			1	✓				
89			↓	40	Joint compound			1	✓				
90		↓	Office	39	Ceiling Drywall	↓	↓	1	✓				

Relinquished By & Company: A. Fajardo 10/1/2020	Received By Company: Jiarui Pang
Date & Time	Date & Time: 10/3/20 12:30

Analyzed By: E.Loukianova
Date & Time: Elf 10.5.20

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 100	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/ 1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
91		7th	Office	40	Join Compound	NAD	T.O	1	✓				
92			Call Closet	41	SOFP White	D		1	✓				
93			↓ ↓	41	↓ ↓	↓		1	✓				
94		↓	↓ ↓	41	↓ ↓	↓		1	✓				
95		6th	Parking Deck	42	2'x4' ceiling tile	D		1	✓				
96		↓	↓ ↓	42	↓ ↓	↓		1	✓				
97		↓	↓ ↓	42	↓ ↓	↓		1	✓				
98		5th	↓ ↓	43	Ceiling Fixture/Stucco	D		1	✓				
99			Parking Deck	44	SOFP I Beam/column			1	✓				
100	27	↓	↓ ↓	45	Brick Expansion Joint	↓	↓	1	-		✓		(+) 1.54% CHR

Relinquished By & Company:	A. Fajardo	Received By Company	Jiarui Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

Analyzed By: E Lenkiewicz
Date & Time: EL 10.5.20

OMEGA
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com **and jaimev@omega-env.com** 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 110	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as Indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
101		5th	Parking Deck	46	Concrete Decking	SD	TO	1	✓				
102	28	↓	↓	47	Concrete Walls Expansion Join	↓	↓	1			✓		(-) AAD
103	29	↓	↓	48	Expansion Join white	↓	↓	1			✓		(-) AAD
104		4th	Parking Deck	46	Concrete Decking			1	✓				
105		↓	↓	43	Ceiling Texture/stucco			1	✓				
106		↓	↓	44	SOFP I Beam/column			1	✓				
107	30	↓	↓	45	Brick Expansion Join			1			✓		NA
108	31	↓	↓	47	Concrete Walls Expansion Join			1			✓		(-) AAD
109	32	↓	↓	48	Expansion Join White	↓	↓	1			✓		↓
110		3rd	↓	46	Concrete Decking	SD	↓	1	✓				

Relinquished By & Company:	A. Fajardo	Received By Company	Viarsi Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

Analyzed By: E. Loukianova
Date & Time: Cly 10.5.20

OMEGA ENVIRONMENTAL SERVICES, INC.
280 Huyler Street South Hackensack, NJ 07606
T 201.489.8700 F 201.342.5412
website www.omega-env.com

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and jaimev@omega-env.com 20-10-15

Project Name:	PS&S LLC	Turnaround Time Requested: 24 Hours	
Project #:	20-1205	Total # of Samples: 120	
Site Location:	Elizabethtown Plaza & Caldwell Place, Elizabeth, NJ 07201	Analyze by each individual layer or as indicated	
Sampled By:	A.Fajardo License # 02-07292 / Jaime Vidal License #00-06823 / Investigator # 134918	Analyze all samples without 1st positive stop	
Date Sampled:	10/1 /2020	Stop after 1st positive for each homogeneous area	X

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	Description of Homogeneous Material (type, color, size, etc)	General Condition	Quantity	Estimated # of layers	Analysis Requested: PLM	PLM-NOB	TEM-NOB	Other Analysis	Notes and Comments
111		3rd	Parking Deck	43	ceiling Texture/stucco	SD	T.O.	1	✓				
112				44	SOFP I Beam/column			1	✓				
113	33			45	Brick Expansion Join			1			✓		NA
114		2nd		46	concrete Decking			1	✓				
115				43	ceiling Texture/stucco			1	✓				
116				44	SOFP I Beam/Column			1	✓				
117	34			45	Brick Expansion Join			1			✓		NA
118		1st		46	Concrete Decking			1	✓				
119				43	ceiling Texture/stucco			1	✓				
120				44	SOFP I Beam/Column			1	✓				

Relinquished By & Company	A. Fajardo	Received By Company	Jiayin Pang
Date & Time	10/1/2020	Date & Time:	10/3/20 12:30

Analyzed By: E. Lauckiavo
Date & Time: Ehf 10.5.20

B. PCBs

B1. Laboratory Analytical Reports

Accredited Analytical Resources, LLC.

09 October 2020 AAR Work Order: 2001607

David Ekstrand
OMEGA ENVIRONMENTAL SERVICES
280 Huyler Street
South Hackensack, NJ 07606
Project: PS&S Garage 20-1205

Enclosed are the results of analyses for samples received by the laboratory on 10/02/2020 15:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Daniel Miguel
Technical Director

New Jersey Certification Number: 12007
New York Certification Number: 11109
Pennsylvania Certification Number: 68-02799
CT Certification Number: PH-0219

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

Analytical Report for Samples

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
1205-01	2001607-01	Caulk	10/01/2020 00:00	10/02/2020 15:25
1205-02	2001607-02	Caulk	10/01/2020 00:00	10/02/2020 15:25
1205-03	2001607-03	Caulk	10/01/2020 00:00	10/02/2020 15:25
1205-04	2001607-04	Caulk	10/01/2020 00:00	10/02/2020 15:25

Notes and Definitions

* Values outside of QC limits
ND - Indicates compound analyzed for but not detected at or above the MDL
J - Indicates estimated value for TICs and all results when detected below the RL
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit
RL - Reporting limit
NFL - No Free Liquids
VC - The container(s) provided by the client for soil volatiles do not meet the requirements of EPA SW846-5035A. Results reported below 200 ug/kg may be biased low due to samples not being collected according to EPA SW846 5035A requirements.

Methodology Summary

PCB by EPA Method SW846 8082:
8082A

Wet Chemistry:
Percent Solids by SM 2540 G

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Daniel Miguel, Technical Director

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

Condition of Samples on Receipt

Temperature °C	20.00
Chain of Custody Filled Out Properly	Yes
Received with Proper Containers	Yes
Received with Proper Volumes	Yes
Received Within Holding Time	Yes
Samples Received with Correct Preservation	Yes
Samples Received On Ice	No
Sample Received Via Field Services	No
Samples Hand Delivered	Yes

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Daniel Miguel, Technical Director

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

Client ID: 1205-01

Lab ID: 2001607-01 (Caulk)

CAS #	Analyte	Result	MDL	RL	Units	Dilution	Prepared Date	Analyzed Date/By	Method	Notes
					Accredited Analytical Resources LLC					
PCB by EPA Method SW846 8082A										
Sample Prepared by Method:EPA 3540C										
12674-11-2	Aroclor-1016	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
11104-28-2	Aroclor-1221	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
11141-16-5	Aroclor-1232	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
53469-21-9	Aroclor-1242	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
12672-29-6	Aroclor-1248	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
11097-69-1	**Aroclor-1254**	**1360**	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
11096-82-5	Aroclor-1260	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
37324-23-5	Aroclor-1262	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
11100-14-4	Aroclor-1268	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:09/JAM	EPA 8082A	
Surrogate: Tetrachloro-m-xylene				*97.3 %*	*27-137*		*10/06/20 10:42*	*10/08/20 12:09/JAM*	*EPA 8082A*	
Surrogate: Tetrachloro-m-xylene				*92.8 %*	*39-138*		*10/06/20 10:42*	*10/08/20 12:09/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*79.1 %*	*21-150*		*10/06/20 10:42*	*10/08/20 12:09/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*90.2 %*	*24-171*		*10/06/20 10:42*	*10/08/20 12:09/JAM*	*EPA 8082A*	
Wet Chemistry										
Sample Prepared by Method:Percent Solids										
NA	**Percent Solids**	**100**	0.100	0.100	%	1	10/02/20 12:15	10/05/20 08:52/NIN	SM 2540 G	

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Daniel Miguel, Technical Director

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

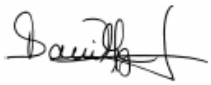
Client ID: 1205-02

Lab ID: 2001607-02 (Caulk)

CAS #	Analyte	Result	MDL	RL	Units	Dilution	Prepared Date	Analyzed Date/By	Method	Notes
				Accredited Analytical Resources LLC						
PCB by EPA Method SW846 8082A										
Sample Prepared by Method:EPA 3540C										
12674-11-2	Aroclor-1016	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
11104-28-2	Aroclor-1221	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
11141-16-5	Aroclor-1232	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
53469-21-9	Aroclor-1242	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
12672-29-6	Aroclor-1248	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
11097-69-1	**Aroclor-1254**	**2820**	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
11096-82-5	Aroclor-1260	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
37324-23-5	Aroclor-1262	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
11100-14-4	Aroclor-1268	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 12:46/JAM	EPA 8082A	
Surrogate: Tetrachloro-m-xylene				*75.1 %*	*27-137*		*10/06/20 10:42*	*10/08/20 12:46/JAM*	*EPA 8082A*	
Surrogate: Tetrachloro-m-xylene				*50.9 %*	*39-138*		*10/06/20 10:42*	*10/08/20 12:46/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*47.0 %*	*21-150*		*10/06/20 10:42*	*10/08/20 12:46/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*65.4 %*	*24-171*		*10/06/20 10:42*	*10/08/20 12:46/JAM*	*EPA 8082A*	
Wet Chemistry										
Sample Prepared by Method:Percent Solids										
NA	**Percent Solids**	**100**	0.100	0.100	%	1	10/02/20 12:15	10/05/20 08:52/NIN	SM 2540 G	

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Daniel Miguel, Technical Director

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

Client ID: 1205-03

Lab ID: 2001607-03 (Caulk)

CAS #	Analyte	Result	MDL	RL	Units	Dilution	Prepared Date	Analyzed Date/By	Method	Notes
				Accredited Analytical Resources LLC						
PCB by EPA Method SW846 8082A										
Sample Prepared by Method:EPA 3540C										
12674-11-2	Aroclor-1016	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
11104-28-2	Aroclor-1221	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
11141-16-5	Aroclor-1232	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
53469-21-9	Aroclor-1242	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
12672-29-6	Aroclor-1248	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
11097-69-1	**Aroclor-1254**	**3280**	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
11096-82-5	Aroclor-1260	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
37324-23-5	Aroclor-1262	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
11100-14-4	Aroclor-1268	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:16/JAM	EPA 8082A	
Surrogate: Tetrachloro-m-xylene				*74.3 %*	*27-137*		*10/06/20 10:42*	*10/08/20 14:16/JAM*	*EPA 8082A*	
Surrogate: Tetrachloro-m-xylene				*97.7 %*	*39-138*		*10/06/20 10:42*	*10/08/20 14:16/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*54.2 %*	*21-150*		*10/06/20 10:42*	*10/08/20 14:16/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*59.3 %*	*24-171*		*10/06/20 10:42*	*10/08/20 14:16/JAM*	*EPA 8082A*	
Wet Chemistry										
Sample Prepared by Method:Percent Solids										
NA	**Percent Solids**	**100**	0.100	0.100	%	1	10/02/20 12:15	10/05/20 08:52/NIN	SM 2540 G	

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Daniel Miguel, Technical Director

Accredited Analytical Resources, LLC.

OMEGA ENVIRONMENTAL SERVICES		
280 Huyler Street	Project: PS&S Garage 20-1205	**Reported:**
South Hackensack NJ, 07606	Project Manager: David Ekstrand	10/09/2020 13:03

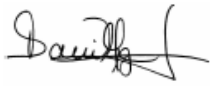
Client ID: 1205-04

Lab ID: 2001607-04 (Caulk)

CAS #	Analyte	Result	MDL	RL	Units	Dilution	Prepared Date	Analyzed Date/By	Method	Notes
					Accredited Analytical Resources LLC					
PCB by EPA Method SW846 8082A										
Sample Prepared by Method:EPA 3540C										
12674-11-2	Aroclor-1016	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
11104-28-2	Aroclor-1221	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
11141-16-5	Aroclor-1232	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
53469-21-9	Aroclor-1242	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
12672-29-6	Aroclor-1248	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
11097-69-1	**Aroclor-1254**	**1950**	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
11096-82-5	Aroclor-1260	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
37324-23-5	Aroclor-1262	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
11100-14-4	Aroclor-1268	ND	166	333	ug/kg dry	1	10/06/20 10:42	10/08/20 14:39/JAM	EPA 8082A	
Surrogate: Tetrachloro-m-xylene				*86.8 %*	*27-137*		*10/06/20 10:42*	*10/08/20 14:39/JAM*	*EPA 8082A*	
Surrogate: Tetrachloro-m-xylene				*104 %*	*39-138*		*10/06/20 10:42*	*10/08/20 14:39/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*70.9 %*	*21-150*		*10/06/20 10:42*	*10/08/20 14:39/JAM*	*EPA 8082A*	
Surrogate: Decachlorobiphenyl				*62.8 %*	*24-171*		*10/06/20 10:42*	*10/08/20 14:39/JAM*	*EPA 8082A*	
Wet Chemistry										
Sample Prepared by Method:Percent Solids										
NA	**Percent Solids**	**100**	0.100	0.100	%	1	10/02/20 12:15	10/05/20 08:52/NIN	SM 2540 G	

Accredited Analytical Resources LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Daniel Miguel, Technical Director

CHAIN OF CUSTODY FORM

Accredited Analytical Resources, LLC.
20 PERSHING AVE, CARTERET, NJ 07008
Tel. 732-969-6112 FAX 732-541-1383
WEB: WWW.ACCREDITEDANALYTICAL.COM

CLIENT NAME:	Omega Environmental
ADDRESS:	280 Huyler St.
CITY:	S. Hackensack
STATE:	NJ ZIP: 07606

STATE AGENCY (CIRCLE ONE)	NJ NY PA
PROJECT NAME:	PS&S Garage 20-1205
CONTACT:	David Ekstrand
OFFICE PHONE #	201-489-8700
OFFICE FAX #	
INITIAL RESULTS TO:	Lab@omega-env.com/davide@omega-env.com
EMAIL FOR INVOICE:	

AAR QUOTE #:
AAR WORK ORDER #: 2001607
P.O. #:

ANALYSIS

PRES. CODE → NX
CONT. CODE → PL

COLLECTION INFORMATION

CUSTOMER SAMPLE # / ID	DATE / TIME SAMPLED	MATRIX CODE	DEPTH	# OF CONTAINERS	GRAB (G) COMP (C)	PCb in caulk	AAR SAMPLE #
1205-01	10/1/20			G	x		-01
1205-02	"			G	x		-02
1205-03	"			G	x		-03
1205-04	"			G	x		-04

MATRIX CODES: S = SOIL A = AQUEOUS GW = GROUND WATER WW = WASTE WATER SW = SURFACE WATER P = POTABLE WATER O = OIL K = SOLID X = OTHER
CONTAINER TYPE CODES: G = GLASS P = PLASTIC E = ENCORE PRESERVATIVES CODES: 1 = HCL 2 = HNO_3 3 = H_2SO_4 4 = NaOH 5 = OTHER

TURNAROUND TIME: (CIRCLE ONE) STANDARD X 5 DAY 72 HRS. 48 HRS. 24 HRS. OTHER _____
(IF BLANK STANDARD WILL APPLY)

REPORT TYPE: RESULTS ONLY X REDUCED ____ FULL ____ EDD ____ EXCEL SPREADSHEET ____

COMMENTS: PCBs in Caulk

COOLER TEMP: 20°C

PERSON(S) ASSUMING RESPONSIBILITY FOR SAMPLING: PRINT: David Ekstrand SIGN:

SIGN BELOW WHEN DELIVERING SAMPLES. EACH TIME SAMPLES CHANGE POSSESSION, INCLUDING COURIER DELIVERY, CUSTODY MUST BE DOCUMENTED.

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Print Name: David Ekstrand	Print Name: Kathy Inacio	Print Name:	Print Name:
Signature:	Signature: Kinacio	Signature:	Signature:
Agent of: Omega Environmental	Agent of: AAR	Agent of:	Agent of:
Date Received:	10/2/2020 Time: 1525	Date Received: / /	Time:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Print Name:	Print Name:	Print Name:	Print Name:
Signature:	Signature:	Signature:	Signature:
Agent of:	Agent of:	Agent of:	Agent of:
Date Received: / /	Time:	Date Received: / /	Time:

C. XRF

C1. Laboratory Analytical Reports

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

Company Heuresis Corp.
Model Pb200i
Type XRF Lead Paint Analyzer
Serial Num. 2370
App Version Pb200i-4.1-11

Job ID	Reading #	Date/Time	Inspector	Analytic Mode	LOCATION	Room Equivalent	Wall (side)	Component	Substrate	Color	Paint Condition	Concentration mg/cm2	Result
20-1205	1	10/01/2020 08:33:42	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1.1	Positive
20-1205	2	10/01/2020 08:34:03	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	Positive
20-1205	3	10/01/2020 08:34:23	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	Positive
20-1205	4	10/01/2020 08:34:59	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0.1	Negative
20-1205	5	10/01/2020 08:35:10	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0	Negative
20-1205	6	10/01/2020 08:35:20	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0.1	Negative
20-1205	7	10/01/2020 08:36:05	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof	A	Door	Metal	Green	Deteriorated	0.1	Negative
20-1205	8	10/01/2020 08:36:36	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof	A	Door Buck	Metal	Green	Deteriorated	0.2	Negative
20-1205	9	10/01/2020 08:40:09	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof	Center	Pipe	Metal	Red	Deteriorated	0.1	Negative
20-1205	10	10/01/2020 08:40:37	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof	Center	Pipe	Metal	Red	Deteriorated	0	Negative
20-1205	11	10/01/2020 08:41:35	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof	Center	Pipe	Metal	Yellow	Intact	0.1	Negative
20-1205	12	10/01/2020 08:46:14	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Door	Metal	Green	Deteriorated	0.2	Negative
20-1205	13	10/01/2020 08:48:11	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Door	Metal	Blue	Deteriorated	0.3	Negative
20-1205	14	10/01/2020 08:48:36	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Door Buck	Metal	Blue	Deteriorated	0.5	Negative
20-1205	15	10/01/2020 08:49:43	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Ladder	Metal	Green	Deteriorated	2.7	Positive
20-1205	16	10/01/2020 08:49:57	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Ladder	Metal	Green	Deteriorated	1.3	Positive
20-1205	17	10/01/2020 08:53:25	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Pipe	Metal	Green	Deteriorated	13.3	Positive
20-1205	18	10/01/2020 08:53:55	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance by Caldwell Pl	A	Pipe	Metal	Green	Deteriorated	0.2	Negative
20-1205	19	10/01/2020 08:56:38	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance	A	Pipe	Metal	Green	Deteriorated	16.1	Positive
20-1205	20	10/01/2020 08:57:16	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Roof entrance	A	Ladder	Metal	Green	Deteriorated	1.2	Positive
20-1205	21	10/01/2020 09:01:03	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Roof Penthouse	Ceiling	Ceiling	Concrete	Grey	Deteriorated	0.4	Negative
20-1205	22	10/01/2020 09:03:32	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Roof Penthouse	D	Wall	Wood	Black	Intact	-0.2	Negative
20-1205	23	10/01/2020 09:04:50	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Roof Penthouse	A	Door	Metal	Grey	Deteriorated	0.1	Negative
20-1205	24	10/01/2020 09:08:16	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	A	Stair Railing	Metal	Grey	Deteriorated	1.1	Positive
20-1205	25	10/01/2020 09:08:54	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	Center	Stair Railing	Metal	Grey	Deteriorated	1.8	Positive
20-1205	26	10/01/2020 09:09:36	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	Center	Stair Treads	Metal	Grey	Deteriorated	0.1	Negative
20-1205	27	10/01/2020 09:10:21	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	Center	Stair Stringer	Metal	Grey	Intact	0.8	Negative
20-1205	28	10/01/2020 09:11:26	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	B	Wall	Concrete	Tan	Deteriorated	0.1	Negative
20-1205	29	10/01/2020 09:11:46	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	A	Wall	Concrete	Tan	Deteriorated	0.2	Negative
20-1205	30	10/01/2020 09:12:11	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	A	Wall	Concrete	Blue	Intact	0.5	Negative
20-1205	31	10/01/2020 09:13:47	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	Ceiling	Ceiling	Concrete	Tan	Intact	0.2	Negative
20-1205	32	10/01/2020 09:16:52	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 7th Fl	A	Pipe	Metal	Blue	Intact	0.2	Negative
20-1205	33	10/01/2020 09:18:06	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	D	Wall	Concrete	Blue	Intact	0	Negative
20-1205	34	10/01/2020 09:18:33	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	B	Wall	Concrete	White	Intact	0.1	Negative
20-1205	35	10/01/2020 09:19:35	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	Center	Stair Underside	Metal	Blue	Deteriorated	1.3	Positive
20-1205	36	10/01/2020 09:20:25	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	Center	Stair Underside	Metal	Blue	Deteriorated	1.1	Positive
20-1205	37	10/01/2020 09:25:15	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	Center	Stair Railing	Metal	Grey	Deteriorated	3.9	Positive
20-1205	38	10/01/2020 09:25:31	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	Center	Stair Railing	Metal	Grey	Deteriorated	1.3	Positive
20-1205	39	10/01/2020 09:26:42	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	D	Vertical Pipe	Metal	Grey	Intact	0.2	Negative
20-1205	40	10/01/2020 09:27:20	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	D	Wall	Concrete	Grey	Intact	0.1	Negative
20-1205	41	10/01/2020 09:27:57	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 6th Fl	C	Wall	Concrete	White	Intact	0	Negative
20-1205	42	10/01/2020 09:28:56	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 5th Fl	Ceiling	Ceiling	Concrete	White	Deteriorated	0.4	Negative
20-1205	43	10/01/2020 09:37:51	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 5th Fl	Center	Stair Underside	Metal	Blue	Deteriorated	0.7	Negative
20-1205	44	10/01/2020 09:39:02	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 4th Fl	Center	Stair Underside	Metal	Blue	Deteriorated	1.1	Positive
20-1205	45	10/01/2020 09:39:25	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 4th Fl	Center	Stair Underside	Metal	Blue	Deteriorated	0.5	Negative
20-1205	46	10/01/2020 09:40:43	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 4th Fl	D	Wall	Concrete	White	Intact	0.2	Negative
20-1205	47	10/01/2020 09:41:16	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase 4th Fl	C	Wall	Concrete	Grey	Intact	0	Negative
20-1205	48	10/01/2020 09:43:20	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase Basement	D	Door	Metal	Grey	Intact	0.1	Negative
20-1205	49	10/01/2020 09:46:10	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place Basement	D	Door	Metal	Blue	Intact	0.2	Negative

20-1205	50	10/01/2020 09:46:47	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place Basement	D	Door Buck	Metal	Blue	Intact	0.2	Negative
20-1205	51	10/01/2020 09:47:45	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place Basement	B	Wall	Concrete	Tan	Deteriorated	0.3	Negative
20-1205	52	10/01/2020 09:48:20	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place Basement	D	Wall	Concrete	Blue	Deteriorated	0.2	Negative
20-1205	53	10/01/2020 09:49:30	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	C	Wall	Concrete	Tan	Deteriorated	0.3	Negative
20-1205	54	10/01/2020 09:50:27	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	B	Window Sill	Concrete	Blue	Deteriorated	0.1	Negative
20-1205	55	10/01/2020 09:51:26	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Railing	Metal	Blue	Deteriorated	0.1	Negative
20-1205	56	10/01/2020 09:51:39	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Railing	Metal	Blue	Deteriorated	0.4	Negative
20-1205	57	10/01/2020 09:52:21	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Treads	Concrete	Blue	Deteriorated	0.1	Negative
20-1205	58	10/01/2020 09:52:44	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Stringer	Metal	Blue	Deteriorated	0.9	Negative
20-1205	59	10/01/2020 09:53:37	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Underside	Metal	Blue	Deteriorated	1.3	Positive
20-1205	60	10/01/2020 09:54:06	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Underside	Metal	Blue	Deteriorated	0.7	Negative
20-1205	61	10/01/2020 09:54:34	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 1st Floor	Center	Stair Underside	Metal	Blue	Deteriorated	0.7	Negative
20-1205	62	10/01/2020 09:57:32	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 3rd Floor	A	Wall	Concrete	Blue	Deteriorated	0.1	Negative
20-1205	63	10/01/2020 09:58:20	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 3rd Floor	C	Wall	Concrete	Tan	Deteriorated	0.1	Negative
20-1205	64	10/01/2020 10:09:29	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Wall	Concrete	Tan	Deteriorated	0.1	Negative
20-1205	65	10/01/2020 10:09:51	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	A	Wall	Concrete	Blue	Deteriorated	0.1	Negative
20-1205	66	10/01/2020 10:10:42	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	Center	Stair Underside	Metal	Blue	Deteriorated	0.9	Negative
20-1205	67	10/01/2020 10:11:33	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	Center	Stair Newel Post	Metal	Blue	Deteriorated	0.7	Negative
20-1205	68	10/01/2020 10:12:08	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	Center	Stair Railing	Metal	Blue	Deteriorated	0.2	Negative
20-1205	69	10/01/2020 10:13:27	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	Blue	Deteriorated	1.5	Positive
20-1205	70	10/01/2020 10:13:49	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	White	Deteriorated	0.3	Negative
20-1205	71	10/01/2020 10:14:17	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	White	Deteriorated	0.5	Negative
20-1205	72	10/01/2020 10:14:44	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	Blue	Deteriorated	0.7	Negative
20-1205	73	10/01/2020 10:15:03	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	Blue	Deteriorated	0.9	Negative
20-1205	74	10/01/2020 10:15:33	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Staircase by Caldwell Place 6th Floor	D	Vertical Pipe	Metal	Blue	Deteriorated	2	Positive
20-1205	75	10/01/2020 10:25:18	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	6th Floor Garage	C	Wall	Concrete	White	Deteriorated	0.2	Negative
20-1205	76	10/01/2020 10:26:59	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	6th Floor Garage	C	Wall	Concrete	White	Deteriorated	0.2	Negative
20-1205	77	10/01/2020 10:27:38	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	6th Floor Garage	Center	Column	Concrete	White	Deteriorated	0.3	Negative
20-1205	78	10/01/2020 10:30:04	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	6th Floor Garage	C	Elevator Door	Metal	Blue	Intact	0.1	Negative
20-1205	79	10/01/2020 10:30:27	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	6th Floor Garage	C	Elevator Buck	Metal	Blue	Intact	0.8	Negative
20-1205	80	10/01/2020 10:32:52	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	5th Floor Garage	C	Column	Concrete	White	Intact	0.1	Negative
20-1205	81	10/01/2020 10:33:35	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	5th Floor Garage	C	Column	Concrete	White	Intact	0.1	Negative
20-1205	82	10/01/2020 10:34:04	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	5th Floor Garage	C	Wall	Concrete	White	Deteriorated	0.1	Negative
20-1205	83	10/01/2020 10:42:22	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	2sh Floor Garage Ramp	D	Wall	Concrete	Green	Deteriorated	0	Negative
20-1205	84	10/01/2020 10:45:05	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	2sh Floor Garage Ramp	C	Elevator Door	Metal	Blue	Deteriorated	0.1	Negative
20-1205	85	10/01/2020 10:50:24	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	1st Floor Garage	C	Door Buck	Metal	Grey	Deteriorated	0	Negative
20-1205	86	10/01/2020 11:00:33	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center	A	Wall	Concrete	White	Intact	-0.2	Negative
20-1205	87	10/01/2020 11:01:36	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center	A	Door	Metal	Blue	Intact	0.1	Negative
20-1205	88	10/01/2020 11:02:04	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center	A	Door Buck	Metal	Blue	Intact	0.1	Negative
20-1205	89	10/01/2020 11:05:05	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center	C	Radiator	Metal	Blue	Intact	0.2	Negative
20-1205	90	10/01/2020 11:10:24	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center GYM	A	Wall	Concrete	White	Intact	0.1	Negative
20-1205	91	10/01/2020 11:10:44	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center GYM	B	Wall	Concrete	White	Intact	0.1	Negative
20-1205	92	10/01/2020 11:11:27	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center GYM	A	Door	Metal	Blue	Intact	0.1	Negative
20-1205	93	10/01/2020 11:12:20	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center GYM	Ceiling	Ceiling	Plaster	White	Intact	0.1	Negative
20-1205	94	10/01/2020 11:14:55	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center Bathroom	C	Window Frame	Metal	Silver	Intact	0.3	Negative
20-1205	95	10/01/2020 11:16:55	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center Private Hallway	D	Wall	Concrete	Tan	Intact	6	Positive
20-1205	96	10/01/2020 11:17:20	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	8th Floor Training Center Private Hallway	B	Wall	Concrete	Tan	Intact	0.3	Negative
20-1205	97	10/01/2020 11:17:50	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	9th Floor Training Center Private Hallway	D	Wall	Concrete	Tan	Intact	4.2	Positive
20-1205	98	10/01/2020 11:18:04	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	10th Floor Training Center Private Hallway	D	Wall	Concrete	Tan	Intact	4.8	Positive
20-1205	99	10/01/2020 11:22:36	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center Corner Cell	Ceiling	Ceiling	Metal	Pink	Intact	0.3	Negative
20-1205	100	10/01/2020 11:24:56	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	7th Floor Training Center Cell	Ceiling	Ceiling	Metal	White	Intact	0.4	Negative
20-1205	101	10/01/2020 11:42:36	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	A	Electrical Panel	Metal	Grey	Deteriorated	0.2	Negative
20-1205	102	10/01/2020 11:43:29	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	A	Door Buck	Metal	Grey	Deteriorated	0.5	Negative
20-1205	103	10/01/2020 11:43:53	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	A	Door	Metal	Grey	Intact	0.2	Negative
20-1205	104	10/01/2020 11:44:52	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	D	Fire Pipe	Metal	Red	Intact	1.9	Positive
20-1205	105	10/01/2020 11:45:14	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	D	Fire Pipe	Metal	Red	Intact	0.4	Negative
20-1205	106	10/01/2020 11:45:52	Ken-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	B	Fire Pipe	Metal	Red	Intact	0	Negative

20-1205	107	10/01/2020 11:46:28	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	D	Fire Pipe	Metal	Red	Intact	0.1	Negative
20-1205	108	10/01/2020 11:46:46	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	D	Fire Pipe	Metal	Red	Intact	1.3	Positive
20-1205	109	10/01/2020 11:47:06	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Upper Basement OSY Valves Pump Room	D	Fire Pipe	Metal	Red	Intact	0.1	Negative
20-1205	110	10/01/2020 12:00:32	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	positive
20-1205	111	10/01/2020 12:00:52	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	positive
20-1205	112	10/01/2020 12:01:12	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1.1	positive
20-1205	113	10/01/2020 12:01:33	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0.1	Negative
20-1205	114	10/01/2020 12:01:42	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0.1	Negative
20-1205	115	10/01/2020 12:01:52	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						-0.2	Negative
20-1205	116	10/01/2020 12:06:38	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Electrical Room	A	Wall	Metal	White	Deteriorated	0	Negative
20-1205	117	10/01/2020 12:07:00	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Electrical Room	C	Wall	Metal	White	Intact	0.1	Negative
20-1205	118	10/01/2020 12:09:42	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Garage	D	Wall	Concrete	White	Deteriorated	0.3	Negative
20-1205	119	10/01/2020 12:10:28	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Garage	C	Wall	Concrete	White	Deteriorated	0	Negative
20-1205	120	10/01/2020 12:11:34	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Electrical Room	A	Door Buck	Metal	White	Deteriorated	0.2	Negative
20-1205	121	10/01/2020 12:13:46	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Lower Basement Garage Roadway Ramp	B	Wall	Concrete	Yellow	Deteriorated	0.3	Negative
20-1205	122	10/01/2020 12:16:04	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior	D	Wall	Concrete	White	Intact	0	Negative
20-1205	123	10/01/2020 12:16:20	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior	D	Wall	Concrete	White	Intact	0.3	Negative
20-1205	124	10/01/2020 12:19:01	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Front of Garage	A	Gas Pipe	Metal	Grey	Deteriorated	0	Negative
20-1205	125	10/01/2020 12:20:07	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior-Front of Garage	A	Foundation	Concrete	Yellow	Deteriorated	0.2	Negative
20-1205	126	10/01/2020 12:22:46	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Exterior- Caldwell Side	B	Fire Pipe	Metal	Red	Deteriorated	0.7	Negative
20-1205	127	10/01/2020 12:27:22	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	Positive
20-1205	128	10/01/2020 12:27:51	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1	Positive
20-1205	129	10/01/2020 12:28:10	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						1.1	Positive
20-1205	130	10/01/2020 12:28:29	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0	Negative
20-1205	131	10/01/2020 12:28:54	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0	Negative
20-1205	132	10/01/2020 12:29:03	Keri-Dean Scarlett	Lead Paint	Union County Court Garage	Calibration						0	Negative

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Omega Laboratories, Inc.
280 Huyler Street
S. Hackensack, NJ 07606

FILE NUMBER: 99-0200
LICENSE NUMBER: 29673
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/27/2020
EXPIRATION DATE: 02/28/2021

Duly Authorized Representative – Gary Mellor.

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Omega Environmental Services, Inc.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires November 16, 2022

LBP-10722-2
Certification #

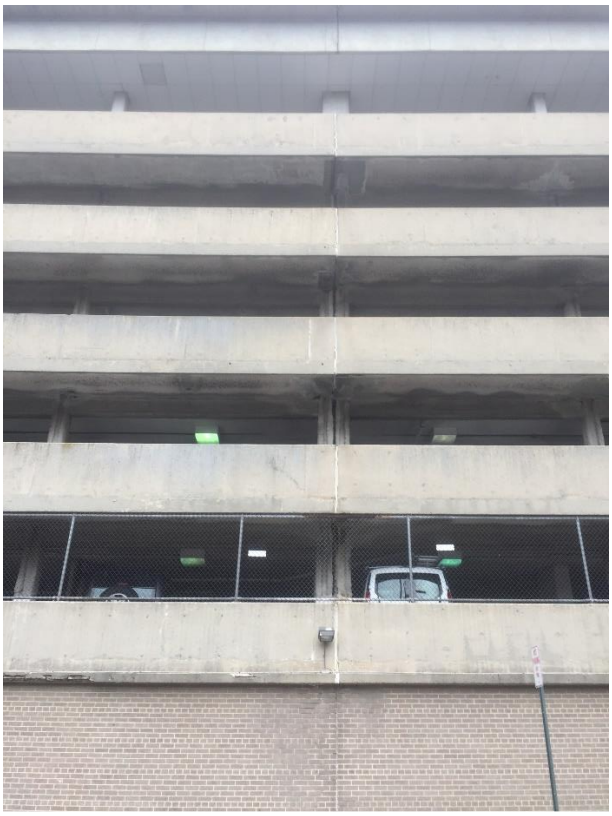
May 16, 2019
Issued On

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

ELIZABETHTOWN PARKING GARAGE PRE-DEMOLITION ASBESTOS ABATEMENT WORK PLAN

CLIENT CONTACT:	Michael Cohen Paulus, Sokolowski & Sartor, LLC 3 Mountainview Road Warren, NJ 07059
SITE/BUILDING:	Elizabethtown Parking Garage Elizabethtown Plaza & Caldwell Place Elizabeth, NJ 07201
SCOPE OF WORK:	Pre-Demolition Abatement Work Plan
ESTIMATED PROJECT SCHEDULE:	To be determined
COMPLETION DATE:	To be determined
WORK PLAN ISSUE DATE:	5/11/2021
OMEGA CONTACT(S):	Stan Blackman, USEPA AHERA Asbestos Project Designer
REVIEWED BY:	Veronica Kero (CIH. PE.)

Ω Omega Environmental Services, Inc. 280 Huyler Street • South Hackensack, NJ 07606 • Tel: (201) 489-8700 • Fax: (201)342-5412



Exterior

Exterior

Exterior brick

Roof top prison yard

SOFP

SOFP

ACM Stucco ceiling

ACM Stucco ceiling

Upper floor bridge connection to the Annex building

Vent flashing

Vent flashing

Pipe fittings

Pipe fittings

OMEGA
ENVIRONMENTAL SERVICES, INC

Table of Contents

PART 1
GENERAL

Section 1.01 Site Description:

This Asbestos Abatement Work Plan covers the proper and legal removal and disposal of asbestos-containing materials (ACM) by a licensed Asbestos Abatement Contractor prior to full demolition of the structure to grade. This Asbestos Abatement Work Plan is supplementary to the Site Demolition Work Plan (to be provided by GC). **Since the Parking Garage is structurally intact full interior access with coordinated selective demolition and abatement work is anticipated.**

Previous ACM surveys conducted by Omega Environmental in 2020 indicated the presence of ACM throughout each level. This Work Plan addresses activities for the safe removal of ACM from the Parking Garage structure.

The County of Union plans to issue Demolition Specifications for demolition of the designated structure (Elizabethtown Parking Garage) located at Elizabeth Plaza & Caldwell Place, Elizabeth, NJ which is connected to the Union County New Annex Building via 7th floor walkway. **See Demolition Work Plan for specific demolition requirements.**

(a) The Elizabethtown Parking Garage Site consists of approximately 17,350 sq. ft. (foot print) bounded by J. Christian Bollwage parking garage to the north, Union County Dept. of Corrections to the west, an open lot to the east, and Union County New Annex Building (courthouse) to the south. The Structure has approximately seven above-grade elevations plus a basement level with sidewalk access on the west and north sides of the perimeter. The upper 7th floor previously served as a Juvenile Detention Center with the lower six levels serving as Parking Garage space for Union County employees. Currently, the upper 7th floor is being utilized as temporary storage and locker rooms for Union County employees.

(b) **The Elizabethtown Parking Garage scheduled to undergo pre-demolition abatement is connected to an occupied Union County Annex building (Courthouse) with a covered/enclosed walkway. In order to determine whether the structures are considered "connected" in terms of NJDCA Sub-Chapter 8 classification, Omega spoke to site representative Connor Lynch of "Lehrer Cumming". It appears that water and electrical line re-routing would be required prior to abatement to attempt to de-classify the project to NJDOL requirements only. However, a NJDCA representative would have to make a final determination.**

(c) Selective demolition may be necessary to safely access any concealed ACM. The resulting debris will be separated either manually or mechanically and placed into appropriate containers.

- Additional testing requirements and waste management procedures shall be addressed in Demolition Work Plan.

(d) In conjunction with the 2020 asbestos survey, limited PCB and Lead HazMat screening were also performed (**see pages 14-15**).

(e) Demolition/Abatement Contractor shall perform own progressive safe access inspection to safely stage crews and equipment.

(f) Omega is providing limited project sequencing information based on projected scope of work (SOW). Final "means and methods" to achieve the project goals are to be determined and implemented by the Abatement Contractor(s).

(g) **Approximately 10% of the parking garage was not accessible during the survey due to ongoing use by Union County (counting of voting ballots, other access issues).**

(h) **(Basement) – Destructive sampling of the boilers/MEP was not performed because equipment still in use during the heating season.**

(i) **Sub-Surface parking garage foundation slab edge(s) potentially covered with ACM tar damp-proofing; further testing is required when exposed later.**

(j) Regulatory compliance shall include but is not necessarily limited to applicable requirements set forth by the Federal Environmental Protection Agency (EPA); New Jersey Department of Consumer Affairs (NJDCA), New Jersey Department of Labor (NJ-DOL), New Jersey Department of Health (NJ-DOH), New Jersey Department of Environmental Protection (NJ-DEP), and the Local Building and Health Departments.

(k) The Abatement Contractor shall pay for final clearance air samples which fail to meet the clearance standard. Should a delay occur, due to failure(s) of clearance air testing, all associated expenses such as air sampling labor time and sample analysis costs incurred by the owner (including engineering and laboratory fees) will be the responsibility of and paid by the Abatement Contractor. All abatement work activities, including demobilization, must be completed within the time frame to be determined by the Owner Representative.

(l) If the project is classified as Sub-Chapter 8, Omega to provide a modified version of the Plan for Work Plan submittal to local Building Department.

(m) If the Contractor and/or Subcontractor neglects to carry out activities related to the asbestos abatement work, which could cause endangerment to public health, the Owner may act to correct such deficiencies at the cost of the Contractor.

(n) It is important that no asbestos/lead or other visible dust emission(s) occur at the site perimeter, Otherwise Contractor is responsible for full site and neighboring cleanup.

(o) Contractor is responsible for their own independent verification of asbestos quantities and field conditions-no change orders will be issued for any pre-existing site conditions.

(p) Specification is based solely on an asbestos survey performed by Omega Environmental Inc. in specific areas; additional concealed ACM may exist throughout the structure.

(q) **Because final classification has not been determined Abatement Contractor to provide pricing for both NJDCA non-occupied sub-8 and NJDOL abatement procedures.**

(r) **The 7th floor prison area is currently highly partitioned. If Contractor opts to drive scissor lift(s) up parking garage ramp for ACM SOFP/stucco removal, then separate abatement and selective demolition is likely required to access metal ceiling and ducts.**

Section 1.02 Primary Contacts:

A. Site Location:
Elizabethtown Parking Garage
Elizabethtown Plaza & Caldwell Place
Elizabeth, NJ 07201

B. Owner /Group Representative:
Lehrer Cumming
200 South Avenue East, Suite 302
Cranford, NJ 07016
Contact: Corey Hennings

C. Project Designer/Monitor/Consultant:
Omega Environmental Services, Inc.
280 Huyler Street
South Hackensack, NJ 07606
Contacts: Veronica Kero, Rich Kuiters, Stan Blackman
Phone: 201-489-8700
Fax: 201-342-5412

Section 1.03 Structure/Building Description:

(a) **Elizabethtown Parking Garage** is a seven-story concrete structure with a former Juvenile Detention Center on the 7th floor. The lower six (6) floors contain the parking spaces. The structure also contains a one level basement. The parking garage has an intact roof deck, steel/concrete structure with an approximate (17,350 sq. ft.) footprint area.

(b) The structure appears to be currently structurally sound (*low safety risk*), but conditions could change during the project.

(c) The parking garage exterior appears to be intact with a relatively low to moderate risk of falling façade under normal conditions. However, significant vibrations (such as from heavy equipment) shall be minimized while performing abatement activates.

Section 1.04 Safety Considerations:

(a) Safety Risk Ratings – All construction sites have various levels of safety risk. These risks are addressed in the Contractor Site-Specific Health & Safety Plan (HASP) and means & methods.

Section 1.05 Parking Garage Asbestos Abatement Scope of Work:

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY						
Building	**Location**		**Description of ACM**	**Estimated Removal Quantity**	**Method of Abatement**	**Additional Notes**
	Floor/ Elevation	**Area**				
Parking Garage	Basement	Sprinkler room	Fittings	3 ln. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Elevator Room	Fittings	3 ln. ft.		
		Throughout	Ceiling & Wall Texture/Stucco	14, 500 sq. ft.		
		Concealed boiler + other MEP ACM (gasket, etc.)			TBD once equipment shutdown	
	1	Security control bath	Fittings	2 ln. ft.	NJDCA Sub-8 Asbestos Procedures	
		Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	2	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	3	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	4	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	5	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	6	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
	7	Plumbing chase(s)	SOFP	2,300 sq. ft. (throughout)		
	7	Exterior Facade	Brick Expansion Joint	Throughout		
	Main Roof	Roof	Vent flashing	300 sq. ft. (5 vents)	Exterior roof procedure	
	Main Roof	Roof	Door caulking	2 doors	Non friable	

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	7	Roof top prison yard(s)	Roofing	No access	Exterior roof procedure	Additional testing required when exposed and can be safely accessed
	7	Windows	Caulking/ glazing	No access	TBD	
	Below grade	Foundation slab edge	Vapor barrier/mastic	No access	TBD	
** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition						

Abatement Contractor is responsible for field verification of locations and the quantities of ACM**.**

Section 1.06 Parking Garage Abatement Procedures:

A. Since the subject building is associated with a County facility *N.J.A.C. 5:23 Subchapter 8* requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm **(non-occupied building status *5.23-8.19)*** – See notes on job classification, provide pricing for both options.

B. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.

C. **The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).**

D. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).

E. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require ***NJDCA or NJDOL Variance*** approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.

F. Use of PPE is required at all times when entering and/or entering the worksite.

G. **(ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.**

H. **Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).**

I. **(Saw or torch cutting of 7th floor metal prison ceiling) – Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.**

J. **Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.**

K. **(ACM Expansion Joints) – Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).**

L. **(Vertical Enclosed Mechanical Chases on 7th floor) – Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).**

M. **(Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).**

N. **(Layered Roof Membranes) – Up to six (6) layers of non-ACM roof field with positive ACM roof flashing – two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.**

O. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.

P. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

PART 2:
SCOPE OF WORK

2.01 ACM Abatement Scope of Work

(a) The Scope of Work (SOW) includes filing and permitting, all necessary applications, notifications, and fees; insurance; necessary design services; providing skilled, licensed, and certified labor; materials; and equipment necessary for proper preparation, handling, removal, and legal disposal of all identified asbestos-containing materials and contaminated waste from the Property included in the SOW in accordance with all requirements of applicable Federal, State, and local regulations.

(b) The Contractor shall file notification(s) to applicable Federal, State, and local agencies having jurisdiction over this asbestos abatement project. Failure on behalf of the Contractor for submitting notification shall not result in any extension for the timely results of the completion of the work set forth in the Contract. The Contractor shall be responsible and will be required to pay any administrative penalties imposed on the Owner for actions taken or lack thereof by the Contractor.

(c) The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work. The contractor is responsible for all fines, penalties, notices of violations suits or claims related to permitting, notifications, asbestos abatement and disposal of ACM addressed to the contractor, his subcontractors, the Owner, or Engineer and will address any proceedings related to these suits, claims or violations on behalf of theses parties and incur any legal fees, court fees or final judgments against the Contractor, Subcontractor, Owner or Engineer relating to these proceedings.

(d) Onsite water/electrical hookup: Demolition/Abatement Contractor(s) to provide own water trucks, fire hydrant connection, and generators and work trailers. Fire Hydrant permit and meter usage may apply. Contractor to contact local water authority for any fire hydrant access.

(e) The Abatement Contractor shall hold and document daily pre-abatement safety toolbox meetings to review safe work practices and emergency communication programs for the project. The abatement contractor's supervisor and the consultant's project monitor must also ensure that proper fire extinguishing equipment is present. The supervisor shall be knowledgeable in the use of fire extinguishing equipment, and emergency exit plans.

(f) The Abatement Contractor will provide a waste transport plan to this facility (number of loads per day) or provide an alternate waste transport and disposal option that will allow the project to be completed within 3-4 months or less time and address NJ-DEP waste requirements.

(g) ACM waste containers will be double-lined as required by NJ-DEP.

(h) All work identified for the subject Union County Elizabethtown Property shall be completed according to the approved schedule to be submitted by the Demolition/Abatement Contractor to the Owners Representative/GC.

(i) **Dust control to protect neighboring surroundings and downwind properties is a concern. During all onsite work activities, Contractor needs to have water spray and/or approved EPA safe foam in use during material handling with control of run-off and storm drain protection.**

(j) Asbestos Abatement/Demolition Contractor is responsible for any Waste Hauling Sub-Contractor(s) they hire. This includes ensuring waste hauler has all appropriate local, state, federal licenses, placards, and permits to transport within and or across state lines.

(k) Equipment Operators shall be staged outside immediate abatement work area(s) so they can operate equipment in cabs using OSHA procedures supported by licensed Asbestos Abatement Handler ground crew(s).

(l) Due to the size and scope of this project, the use of a "Decon Trailer" is suggested since the duration of the project would necessitate rebuilding a traditional decon-shed several times.

(m) The abatement activities shall comply with all aspects of the Contract Documents and Federal, State, and local requirements. Whenever there is a conflict or overlap within this Specification and between applicable Codes and Regulations, the most stringent provision shall apply. **ACM Exclusion Zones must be staged so that unprotected workers are not exposed to airborne or tracked asbestos.**

(n) Regulatory compliance means compliance with applicable requirements set forth by the U.S. Environmental Protection Agency (EPA); New Jersey Department of Consumer Affairs (NJDCA), New Jersey Department of Labor (NJ-DOL), New Jersey Department of Health (NJ-DOH), New Jersey Department of Environmental Protection (NJ-DEP), and the Local Building and Health Departments.

(o) Asbestos air and progress third-party monitoring during building asbestos abatement and ACM separation shall be performed by a third party asbestos consulting firm.

(p) If the Contractor neglects to carry out activities related to the ACM abatement work, which could cause endangerment to public health, the Site Representative may act to correct such deficiencies.

(q) ACM and non-asbestos containers to be logged and tracked in order to determine eligibility for payment; estimated ACM quantities provided herein are for bidding purposes only. PS&S and Omega make no representations as to the accuracy of quantity estimates.

(r) While the Omega asbestos survey team accessed the building/structure prior to demolition, access was limited to interior only (no access to building exterior or roof). Therefore, it was not feasible to test every single potential suspect ACM material such that the Contractor has to be willing to accept the delineation limitations.

2.02 Special Handling Procedures

a. Health and Safety Procedures described elsewhere are to be followed during the ACM abatement project, as well as requirements set forth in OSHA *Asbestos in Construction Standard (29CFR1926.58)*.

2.02.1 PCB and LBP Hazmat Screening

a. Additional PCB testing of stockpile demolition debris is likely required as the project progresses.

Pre-Demolition limited PCB in Caulk Screening Summary			
Building	**Sample #**	**Location/Description**	**Results (mg/kg)**
Parking Garage	1205-01C	Penthouse exterior wall, near roof level	1.360
	1205-02C	Column to brick, north and south sides	2.820
	1205-03C	Wall to brick, north and south sides	3.280
Parking Garage	1205-04C	Deck centerline double columns	1.950
Additional PCB containing caulk likely exists throughout the structure			

b. Lead-Based Paint (LBP) has been identified on several substrates. Contactor to follow *OSHA Lead in Construction Standard* during all activities if appropriate (see LBP table below).

Pre-Demolition limited LBP Screening Summary			
Parameter Investigated	Suspected Positive Materials	Estimated Total Quantity of Material	Recommended Action
Lead Based Paint (LBP)	Exterior – Roof Entrance by Caldwell Pl – Ladder (Metal)	Two (2)	Conduct demolition activities in accordance with OSHA *Lead in Construction Standard*
	Exterior – Roof Entrance by Caldwell Pl – Pipe (Metal)	One (1)	
	Exterior – Roof Entrance – Pipe (Metal)	One (1)	
	Exterior – Roof Entrance – Ladder (Metal)	One (1)	
	Staircase 7th Floor – Stair Railing (Metal)	Two (2)	
	Staircase 6th Floor – Stair Underside (Metal)	Two (2)	
	Staircase 6th Floor – Stair Railing (Metal)	Two (2)	
	Staircase 4th Floor – Stair Underside (Metal)	One (1)	
	Staircase by Caldwell Place 1st Floor – Stair Underside (Metal)	One (1)	
	Staircase by Caldwell Place 6th Floor – Vertical Pipe (Metal)	One (1)	
	7th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	
	9th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	
	10th Floor Training Center Private Hallway – Wall (Concrete)	One (1)	

Pre-Demolition limited LBP Screening Summary			
	Upper Basement OSY Valves Pump Room – Fire Pipe (Metal)	Two (2)	

2.02.2 **Large Items – I-Beams, Frames and non-Porous Pipes, eq.**

a. All ACM that can be safely abated in place will be completed prior to lowering of the structure.

b. Waste container staging areas shall be on asphalt or other non-exposed soil areas.

c. Contractor to establish an adequate staging area to clean large metal if ACM is identified on the metal surface.

d. Non-ACM demolition debris may be stored on-site in new piles, distinct from piles that are yet to be separated. Once space allows, separated non-ACM demolition debris may be loaded into roll-off dumpsters or dump trucks for off-site disposal.

e. Since the project includes ACM abatement, a full personnel decontamination system shall be located and established on the Property. The location should take into consideration the movement, and separation of ACM and non-ACM debris. It shall also take into consideration the demolition of remaining structures and their potential instability. The Contractor shall be responsible for establishing water supply to the decontamination system and wastewater disposal from the system.

2.02.3 **Debris:**

a. It is expected that during abatement, debris will be removed as ACM in lined containers according to NJDEP requirements.

b. Debris (ACM waste, non-ACM debris) shall be removed from the Property. Exterior facade, concrete slab/deck, and roof shall be barricaded to prevent the potential for accidental fall hazards. Perimeter fencing shall remain in place to secure the Property.

2.02.4 **Site Specific Procedures:**

A. **On-site Cleaning Procedure for Segregation of Metal Scrap**

- The scrap metal is expected to be cleaned if applicable during abatement.
- Contractor shall establish an acceptable system for on-site scrap metal segregation, and loading for offsite recycling.

B. **Contractor Procedures regarding Outlier Asbestos by 3rd Party Air Monitor**

- Contractor shall establish a system for monitoring ambient air conditions and for responding to asbestos or dust readings which call for immediate corrective action, including:

1. Upgrade or revise dust control measures.
2. Re-stage work crews; and/or.
3. Stop work action.

- Contractor shall use the following parameters for outlier delineation of asbestos air

    1. Asbestos perimeter monitoring: <0.01 f/cc (PCM) and or <70 s/mm2 (TEM)
    2. Asbestos monitoring inside Property work area(s): <0.01 f/cc (OSHA PEL) inside work area(s).

C. **Special Health Safety Requirements**

- No co-mingled ACM debris will be tracked off-site into personal vehicles. Work boots shall be left on-site and not be worn in personal vehicles unless thoroughly decontaminated first and/or bagged.

- Contractor employees and sub-contractors shall decon out at the conclusion of each shift and before lunch break.

- Contractor shall establish a "clean" decon staging area at the project perimeter where the ground has been pre-cleaned and/or covered so that personal footwear can be worn.

- Once an area has been categorized and removed (and there is no risk of re-contamination by ACM removal activities), underlying slabs shall be cleaned so that the area is no longer part of the ACM contamination work zone.

- The ACM contamination work areas shall be delineated and barricaded to avoid cross-contamination of cleaned area(s).

D. **Contractor EH&S Site Rules**

- Preparation activities that cause airborne ACM levels to increase have to be avoided until abatement exclusion zones are set up.

- Anyone accessing onto the Property must have received "Asbestos Awareness Training".

- No materials handling practices shall create additional collapse, trip, flying projectile, or sharp hazards in/around the job site.

- Equipment that makes contact with ACM shall be decontaminated and have air filters changed prior to removal from the Property.

- Work area security will be maintained 24/7 to prevent general public Property access.

- Contractor shall not discharge decontamination water into storm drains except under the terms of a pre-approved Water Management Plan and/or Permit.

- Contractor is responsible for providing electrical power and water (tanker truck and/or obtain fire hydrant connection permit). Generator fueling should not be staged on bare unprotected soil.

- No torch cutting or other hot work permitted without prior approval.

- If any confined space or shoring hazards are encountered, the Contractor is responsible for reporting such conditions to the Owner Representative(s) before proceeding with work.

- Elevation work 4-ft. above ground level requires a Fall Protection Plan and use of fall protection devices.

- Contractor shall provide proof of operators' training and applicable certification for use of any heavy equipment, scissor lift, and/or other equipment.

E. **Off-Site Asbestos/Demolition Waste Transport and Disposal Approval**

- The Contractor(s) shall provide information pertaining to proposed ACM and demolition debris off-site disposal facilities and transport companies to the Site Representative for approval.

- After asbestos waste is properly packaged on-site and the container is attached to the waste transport truck with an NJDEP placard, the container cannot be transferred to another waste hauler. The asbestos waste has to be directly transported to the approved asbestos landfill with no load mixing.

- Owner's Representative and Abatement Contractor must maintain records/manifest of all trucks leaving the property with ACM waste.

- Daily toolbox safety briefing with sign-in sheets required.

- Potential onsite safety issues to be addressed in contractor HASP trip hazards, slips, inhalation hazards, skin contact issues, etc.

F. **Ground and other Special Environmental Protection**

- All abatement/demolition/washing activities to be placed in pre-approved areas (coordinate with GC).

- Contractor(s) to erect a watertight dike and/or spill berm around washing staging areas to prevent uncontrolled runoff water.

- Any use of chemical-containing products (e.g. dust suppressant foam etc.) requires pre-approval of SDS Sheet.

- Unfiltered ACM or other contaminated water has to be collected by Contractor(s), not discharged to storm drains that have to be protected.

- Contractor to provide appropriate equipment to pump decon water into a temporary holding tank for later reuse within the exclusion zone or to wet outgoing ACM loads as required.

- If "gray water" (non-ACM water) begins to accumulate, the Contractor can then call for a tanker to pump off and dispose of.

- Contractor to have a spill cleanup containers/storage kit(s) available on Property to address any hydraulic fuel/ and other spills.

- Sidewalk curbs and roadways need to be free of any worksite debris. If any debris is found, then Abatement Contractor to immediately clean up the area so as to not potentially expose the public and/or surrounding neighborhood to hazards.

G. **Heavy Equipment Decontamination**

- Heavy equipment used to load contaminated ACM debris has to be decontaminated at the conclusion of shift and undergo more thorough service if/when leaving off-site (change the air filter, etc.).

H. **Site Security**

- Existing Parking Garage entrance to be maintained locked overnight so that the general public cannot trespass onto the Property.
- Contractor to assign overnight contact in event Security has an issue to address.
- Crew headcount "in/out" shall be recorded at the decon entrance/exit.

I. **Contractor Project Submittals**

(Pre-project)

- Copy of NJ Asbestos Abatement License.
- Copy of NJ Asbestos Abatement Filing.
- Asbestos abatement sequence, means, and methods.
- Copies of abatement worker/supervisor licenses, medicals, and fit-tests.
- Approved Contractor HASP and work plan for ACM removal.
- Site Protection Plan.
- Emergency Response Plan (dust reading, fire, flood).
- Dust Control Plan.
- Contractor Waste Transportation and Disposal Plan.

(During-project for progress payments)

- Any ACM filing updates.
- Copies of worker/personal/OSHA air sampling data posted onsite.
- Progress ACM Waste Manifests.
- Copies of load tickets.

- NJ ACM waste fee statement

(Final post-project submittal to release retainage)

- Final Contractor report package to include copies of all the above items.
- Returned landfill copies of waste manifest and proof of NJ ACM waste fee payments.

J. **Contractor Project Management**

- Contractor must have an assigned Site Superintendent on the Property during working hours to manage ACM abatement and other crews, and to interface with Owner Representative(s), Consultants, and regulatory agency Inspectors.
- If workers are observed to be onsite smoking, eating in exclusion zone areas, not decontaminating out properly, not wearing correct PPE, or engaging in other non-compliant activities, the Site Superintendent shall be instructed to document said infraction which will result in a warning and/or immediate dismissal from the property. The Owner and Site Representative reserve the right to terminate an employee for not following EH&S Site Rules.
- Contractor shall file notification(s) to applicable Federal, State, and local agencies having jurisdiction over this ACM abatement project. Failure on behalf of the Contractor for submitting notification shall not result in any extension for the timely results of the completion of the work set forth in the Contract. The Contractor shall be responsible and will be required to pay any administrative penalties imposed on the Owner for actions taken or lack thereof by the Contractor.
- If there are any abatement schedule breaks (not anticipated), Abatement Contractor may be required to initiate multiple regulatory filings.
- Upon completion of ACM removal, the Contractor shall provide completed, signed and notarized statements stating all identified ACM within the scope of work have been properly removed in accordance with applicable rules and regulations.
- **Contractor(s) to coordinate water/electricity hookup(s) with County and/or County Representative(s) for abatement.**
- Contractor is responsible for all fines, penalties, notices of violations suits or claims related to permitting, notifications, ACM abatement, and disposal of ACM addressed to the contractor, his subcontractors, the Owner, or Engineer and will address any proceedings related to these suits, claims or violations on behalf of these parties and incur any legal fees, court fees or final judgments against the Contractor, Subcontractor, Owner or Engineer relating to these proceedings.
- Contractor shall hold and document daily pre-abatement safety toolbox meetings to review safe work practices and emergency communication program for the project. The abatement contractor's supervisor and the consultant's project monitor must also ensure that proper fire extinguishing equipment is present. The supervisor shall be knowledgeable in the use of fire extinguishing equipment, and emergency exit plans.

PART 3
GENERAL ASBESTOS SPECIFICATIONS

3.01.1 REFERENCE STANDARDS AND NOTICES

A. Except to the extent that more explicit or more stringent requirements are written directly into this Specification, all applicable codes, regulations, and standards have the same force and effect (and are made a part of this specification by reference. Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the Property, and persons occupying areas adjacent to the Property. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations. Contractor shall hold the Owner and Owner's Engineer harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of himself, his employees, or his subcontractors.

A. Federal Regulations:

a. 29 CFR 1910.1001, "Asbestos" (OSHA)

b. 29 CFR 1910.1200, "Hazard Communication" (OSHA)

c. 29 CFR 1910.134, "Respiratory Protection" (OSHA)

d. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)

e. 29 CFR 1926, "Construction Industry" (OSHA)

f. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)

g. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)

h. 40 CFR 61, Subpart A, "General Provisions" (EPA)

i. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)

j. 49 CFR 171-172, Transportation Standards (DOT)

C. New Jersey Regulations

State requirements which govern ACM abatement work and hauling and disposal of ACM waste materials include but are not necessarily limited to the following:

a. N.J.A.C. 7:26

b. N.J.A.C. 12:120

c. N.J.A.C. 8:60

D. Local Requirements

Local agencies which may govern or have certain requirements regarding ACM abatement work or hauling and disposal of ACM waste materials include but are not necessarily limited to the following:

a. Building Department

b. Health Department

c. Fire Department

E. Standards and Guidance Documents:

Standards and guidance documents which apply to ACM abatement work or hauling and disposal of ACM waste material include but are not necessarily limited to the following:

a. America National Standards Institute (ANSI)

- Fundamentals Governing the Design and Operation of Local Exhaust Systems Publication Z9.2-79
- American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection

b. American Society for Testing and Materials (ASTM)

- Safety and Health Requirements Relating to Occupational Exposure to Asbestos E 849-82.

c. Underwriters Laboratories, Inc. (UL)

Standards: 586 (High-Efficiency Particulate Air filter units).

F. Notices

a. Contractor shall send by certified mail, all required notifications to all applicable governing agencies as required by Federal, State, and local regulations. Failure on behalf of the Contractor to file notifications as required shall not result in any extension of the completion date set forth in the Contract. Also, at least 7 days prior to initiation of abatement work, required signs must be posted.

b. U.S. Environmental Protection Agency: Send Written Notification as required by EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Asbestos Regulations (40 CFR 61, Subpart M) to the regional Asbestos NESHAP Contact at least 10 working days prior to beginning any work on ACM. Send notification to the following address:

EPA Region II
Asbestos NESHAP Contact Air and Waste Management Division
290 Broadway
New York, New York 10007

c. The following information shall be included in the notification to the NESHAPS contact, at a minimum:

- Name, address, and telephone number of owner or operator;
- Name, address, telephone number, and asbestos license number of the asbestos abatement contractor;
- Description of the facility being demolished or renovated, including the size, age, and prior use of the facility;
- Estimate of the approximate amount of friable ACM present in the facility in terms of linear feet of pipe, and surface area on other facility components. For facilities in which the amount of friable ACM is less than 80 linear meters (260 linear feet) on pipes and less than 15 square meters (160 square feet) on other facility components, explain techniques of estimation;
- Location of the facility being demolished or renovated;
- Scheduled starting and completion dates of demolition or renovation;
- Nature of planned demolition and method(s) to be used;
- Procedures to be used to comply with the requirements of USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) Asbestos Regulations (40 CFR 61 Subpart M);
- Name and location of the waste disposal site where the friable ACM waste material will be deposited;
- Name and license number of the waste hauler;
- The nature of ACM abatement;
- Amount of asbestos-containing materials to be removed;
- Update the notification whenever the amount changes by at least 20 percent; and,
- Re-notify EPA if start date changes from originally given date.

d. State and Local Agencies: The Contractor shall send written notification as required by State and local regulations and obtain a construction permit for an ACM abatement pursuant to regulatory requirements prior to beginning any work on asbestos-containing materials to all applicable State and local agencies. This is the sole responsibility of the Contractor. Send a notification at least 10 working days prior to beginning any abatement work.

e. The Contractor shall post all notices required by applicable Federal, State, and local regulations. Maintain two copies of applicable Federal, State, and local regulations and standards. Maintain one copy of each at the worksite. Keep on file in the Contractor's office one copy of each.

f. The Contractor shall notify other entities at the job site of the nature of the ACM abatement activities, the location of asbestos-containing materials, requirements relative to ACM set forth in these specifications, and applicable regulations. All notification shall first be cleared through the Owner’s Representative.

g. The Contractor shall notify emergency service agencies including fire, ambulance, police, or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering the work area, emergency entry and exit locations, modifications to fire notification or firefighting equipment, and other information needed by agencies providing emergency services. The Contractor shall clearly post telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, and power, and telephone Companies.

3.01.2 QUALITY ASSURANCE

A. Qualifications

a. The Contractor shall be licensed by the New Jersey Department of Labor to perform ACM removal work and shall have a minimum of 5 years of experience in performing such work. The Contractor shall also have had a completion record of work performed on a minimum of five (5) projects of similar nature, size, and scope.

b. All Contractor personnel involved with ACM removal work must be thoroughly familiar with the standard operating procedures of the Contractor for removal work as well as all applicable Federal and State regulations governing ACM removal work.

c. The Supervisor and Asbestos Abatement workers shall be accredited in accordance with EPA regulation 40 CFR Part 763, subpart E, Appendix C; and New Jersey Departments of Labor and Health regulations cited as N.J.A.C. 12:120 and 8:60, respectively.

3.01.3 SUBMITTALS

A. Pre-Work Submittals: No later than 7 calendar days prior to mobilization to the Property for initiation of asbestos abatement activates, the Contractor shall submit 3 copies of the documents listed below::

a. Valid Contractor's ACM Removal license issued by the New Jersey Department of Labor (NJ-DOL).

b. Certificate of insurance covering the work of this Contract.

c. Work Schedule:

- Show the complete sequence of abatement activities and the sequencing of Work within each building section.
- Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
- Show the projected percentage of completion for each item, as of the first day of each month.
- Show final inspection dates.

B. Project Notifications: As required by Federal, State, and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).

C. Abatement Work Plan: The Contractor shall design, prepare and submit to the Owner for

review and approval, a detailed ACM removal plan for the project in accordance with the applicable regulations and these specifications. The plan shall, at minimum, show limits of containment and work areas, methods of removal, the location of decontamination units, number and location of negative air units, waste routes, waste storage location, entrance and exits, emergency exits, and any necessary details. Work shall not commence until the Owner has reviewed, commented, and approved the Contractor's ACM removal plan. Provide plans which clearly indicate the following:

a. ACM exclusion zones to be staged back to front so that areas can be cleaned and not re-contaminated.

b. Locations and types of all decontamination enclosures.

c. Entrances and exits to ACM Exclusion zones with Asbestos Hazard signs posted.

e. Proposed location and construction of storage facilities and field trailer(s).

f. Location of water and electrical connections to available services (water truck, hydrant, generator).

g. Waste transport routes through the Property.

h. List any site-specific variances that will be petitioned from the State in order to seek relief from any of the abatement requirements listed herewith.

i. Name, location, and applicable licenses for the primary and secondary landfill for disposal of asbestos-containing material and asbestos-contaminated waste.

j. Summary of proposed materials, and equipment to be used.

k. Certification that vacuums, temporary ventilation equipment, and other equipment to be used meet the ANSI 29.2-79 requirement for airborne fiber filtration.

l. If rental equipment is to be used in the work area or to transport asbestos-contaminated waste, provide notice to the rental agency stating the intended use of equipment, with a copy to the Owner.

m. Summary of the Contractor's workforce by disciplines. Include a notarized statement signed by the Contractor documenting that all proposed workers, by name, have received all required medical examinations and have been properly trained and certified in ACM removal work, respirator use, to appropriate EPA and OSHA standards for ACM removal. Include on statement Contractor's compliance with OSHA medical surveillance requirements.

n. The Contractor shall submit his/her Health and Safety Plan and Standard Operating Procedures for this project for use in complying with the requirements of these Specifications and applicable regulations. The Plan shall include, but shall not be limited to distribution and use of amended water, the sequencing of asbestos work, detailed schedules and dates, shift times, and work activities during that shift, the interface of other trades involved in the performance of work, methods to be used to assure the safety of building occupants and visitors to the Property, security of the work areas, and a detailed

description of the methods to be employed to control airborne fiber concentrations.

o. A written description of emergency procedures to be followed in case of injury or fire. This section must also include evacuation procedures, sources of medical assistance, and procedures for access by medical personnel.

p. Level of respiratory protection intended for each operation for the project based upon personal/OSHA ACM and other exposure monitoring data collected by the Contractor.

B. Project Closeout Submittals: Submit the following at the closeout of the Project (no later than 10 calendar days subsequent to final clearance of all abatement areas within a project phase):

a. OSHA compliance air monitoring records conducted during the Work.

b. Daily progress log.

A list of all Workers used in the performance of the Project, including name, social security number, and NJ DOL certification number. Provide a valid copy of the asbestos certification.

c. For each worker assigned in the performance of the Project, submit required employee statements including Medical Examination Statement, Worker's Acknowledgment Statement, Respirator Fit Test, and Employee Training Statement.

d. Certification for the laboratory that analyzed the OSHA personal air samples.

e. A notarized "Release of Liens" in a form acceptable to the Owner. Such notarized release of liens shall certify that all sub-Contractors, labor suppliers, etc. have been paid their pro-rate share of all payments to date for the project, that the Contractor has no basis for further claims, and will not make further claims for payment in any account after the first payment is made to him.

C. Manifests: Originals of all waste disposal manifests, seals, and disposal logs must be provided within 30 calendar days of final clearance of all abatement areas within a project phase.

3.01.4 PRODUCTS

All products, equipment, and material used by the Contractor shall be of sufficient size, configuration, and quality to perform the tasks required. Specific criteria and/or requirements for products used are discussed in Part 3 - Execution of this specification when appropriate.

3.02.1 EXECUTION

A. The Contractor shall inspect and verify all ACM planned for removal from the subject Property as described in Part 1 - Section 1.03 of the Specification under the Scope of Work.

B. The Contractor shall, in areas not easily accessible, use safe means to access and remove ACM.

C. The Contractor shall demonstrate that his/her ACM removal and waste disposal work does not impact in any way the areas beyond the work area. Any cross-contamination of other areas and

materials shall be the sole responsibility of the Contractor. If it is determined by air or surface dust samples that ACM contamination has occurred as the result of negligence and/or poor work practices of the Contractor, the Contractor shall clean and/or dispose of any contaminated materials at no additional cost to the Owner. The Contractor shall be responsible for any damages claimed or lawsuits brought by persons exposed to such contamination.

D. Signs shall be posted which meet the specifications set forth in 29 CFR 1926.1101 at all approaches to the work area. Signs shall be posted a sufficient distance from the work area to permit a person to read the sign and take precautionary measures to avoid exposure to asbestos.

E. Strictly adhere to all precautions necessary to the health and safety of your workers and authorized personnel in accordance with OSHA, EPA, the State of New Jersey, and all local codes. The engineer or Owner's representative on-site is not responsible for the health and safety of the Contractor's personnel.

3.02.2 MATERIAL AND EQUIPMENT

The materials and equipment used during all abatement activities shall conform, at a minimum, to required standards of these specifications, applicable regulations, and the following:

A. Hand power tools used to drill, cut into, or otherwise disturb ACM shall be equipped with HEPA filtered local exhaust ventilation.

B. Electrical equipment shall be Underwriters Laboratory listed and approved.

C. Emergency lighting in case of power failure.

D. If the Contractor opts to stage decon trailer or build on-site decon shed with protection, the construction must satisfy NJDCA/NJDOL requirements.

3.02.3 PERSONNEL PROTECTION

A. Protective Clothing

a. Coveralls: Provide sufficient disposable full-body "Tyvek" coveralls for all workers and also for authorized visitors.

b. Boots: Provide work boots with non-skid soles, and where required by OSHA, foot protection, for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the work area for any reason, after being contaminated with asbestos-containing material. Dispose of boots as asbestos-containing waste at the end of the work or seal in 6-mil poly bags (with labels) for transportation to another work area.

c. Goggles: Provide eye protection (i.e. goggles) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may potentially cause eye injury. Goggles are not required if full-face respiratory protection is used.

d. Gloves: Provide work gloves to all workers and require that they are worn at all times in the work area. Do not remove gloves from the work area and dispose of as ACW at the end of the work.

e. Hard Hats: Provide hard hats to all workers and authorized visitors and require that they are worn at all times in the Work Area. Hard hats shall be worn over the hood of the coveralls.

B. Respiratory Protection Requirements

a. The Contractor shall have a respiratory protection program established, which shall be in compliance with ANSI Z228.2, OSHA 29 CFR 1910 and 1926, 40 CFR 763, Subpart G, and 42 CFR Part 84. A copy of the written program shall be maintained at the job site.

b. Respiratory protection shall be worn by all individuals inside the ACM Exclusion Zone Work Areas(s) from the initiation of the ACM project until all areas have successfully passed final air clearance monitoring.

c. Respiratory type shall be determined by onsite Contractor personal/OSHA ACM air monitoring data.

d. All respiratory protection shall be MSHA/NIOSH approved in accordance with the provisions of 30 CFR Part 11. The Contractor shall provide all respiratory protection.

e. Workers shall be provided with personally issued and individually marked respirators. Respirators shall not be marked with any equipment that will alter the fit of the respirator in any way. Only waterproof identification markers shall be used.

f. Filter Cartridges: Provide at a minimum HEPA type filters labeled with NIOSH and MSHA certification and color-coded in accordance with ANSI Z228.2.

g. Use of disposable masks or quarter-face respirators shall not be permitted.

h. For all ACM abatement work other than preparation activities, non-friable removals and glovebag removal, powered air-purifying respirators with a full facepiece and HEPA filters shall be used as a minimum when the fiber count in the work area is lower than 1 fiber per cubic centimeter (f/cc).

i. For work areas with fiber count greater than 1 f/cc, type "C" supplied air HEPA filter respirators in pressure-demand mode shall be utilized.

j. The Contractor shall have on-site a sufficient quantity of respirators and filters for all asbestos workers and authorized visitors.

3.02.4 TEMPORARY FACILITIES

A. Locate temporary services and facilities where they will serve the work area adequately and result in minimum interference with the performance of the work. Relocate, modify, and extend services and facilities as required during the course of work so as to accommodate the work of this Contract.

a. The Contractor shall provide new or used materials and equipment that are undamaged and in serviceable condition and provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

b. The Contractor shall provide all heavy equipment, and waste contains, etc. as necessary to accomplish the work of this contract. Scaffolding may be of a standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type, or cantilever type. The type, erection, and use of all scaffolding shall comply with all applicable OSHA provisions. Equip rungs of all metal ladders, etc. with an abrasive non-slip surface. Provide a nonskid surface on all scaffold surfaces subject to foot traffic.

B. Water Service

a. Temporary Water Service Connection: All connections to water systems shall include backflow protection. Valves shall be temperatures and pressure rated for the operation of the temperatures and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water hydrant and equipment.

b. Water Hoses: Employ heavy-duty abrasion-resistant hoses with pressure ratings greater than the maximum pressure of the water distribution system to provide water into each work area and to each Decontamination Unit. Provide fittings as required to allow for connection to existing wall hydrants or sprouts, as well as temporary water heating equipment, branch piping, showers, shut-off nozzles, and equipment.

c. Maintain hose connections and outlet valves in leak-proof condition. Where spillage or leakage might damage/flood the surrounding environment, provide a drip pan or collection drum of suitable size to minimize the possibility of water damage/flooding.

C. Electrical Service

a. General: Comply with applicable NEMA, NECA, and UL standards and governing regulations and codes for materials and layout of temporary electric service. Provide a weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate the performance of work during the construction period. Install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of work.

b. Temporary Power: Provide service with fused disconnects connected to a generator distribution panel, if available. Sub-panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work.

c. Ground Fault Protection: Equip all circuits for any purpose entering Work Areas with ground fault circuit interrupters (GFCI). Locate GFCI's exterior to Work Area so that all circuits are protected prior to entry to Work Area. Provide circuit breaker type GFCI equipped with a test button and reset switch for all circuits to be used for any purpose in work area, decontamination units, exterior, or as otherwise required by national electrical code, and OSHA.

d. Electrical Power Cords: Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single length or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.

e. Lamps and Light Fixtures: Provide general service incandescent lamps or fluorescent lamps of wattage indicated or required for adequate illumination as required by the work

or this section. Protect lamps with guard cages or tempered glass enclosures, where fixtures are exposed to breakage by construction operations. Provide vapor tight fixtures in the work area and decontamination units. Provide exterior fixtures where fixtures are exposed to the weather or moisture.

f. Lockout: Lockout all existing power to or through the work area as described below. Unless specifically noted otherwise existing power and lighting circuits to the Work Area are not to be used. All power and lighting to the Work Area and Decontamination facilities are to be provided from a temporary electrical panel described below.

- Lockout power to Work Area by switching off all breakers serving power or lighting circuits in the work area. Label breakers with tape over breaker with the notation "DANGER circuit being worked on". Lock panel and have all keys under control of Contractor's Superintendent or Owner.
- Lockout power to circuits running through Work Area wherever possible by switching off all breakers serving these circuits. Label breakers with tape over breaker with the notation "DANGER circuit being worked on". Sign and date danger tag. Lock panels and supply keys to Supervisor and Owner. If circuits cannot be shut down for any reason, label at interval 4'-0" on center with tags reading, "DANGER live electric circuit. Electrocution hazard."

g. Temporary Electrical Panel: Provide temporary electrical panel sized and equipped to accommodate all electrical equipment and lighting required by the work. Connect temporary panel to generator provided. Protect with circuit breaker or fused disconnect. Locate a temporary panel as directed by the Owner.

h. If not feasible to run electrical wiring overhead then heavy-duty protective cable mats to be utilized to avoid trips and or cord cut hazards.

i. Number of Branch Circuits: Provide sufficient branch circuits as required by the work. All branch circuits are to originate at the temporary electrical panel. At a minimum provide the following:

- One Circuit for each HEPA filtered fan unit.
- For power tools and task lighting, provide one temporary separate 110-120 Volt, 20 Amp circuit, 4-gain outlet (4 outlets per circuit).

i. All lighting to the Work Area and Decontamination facilities is to be provided from a temporary electrical panel described above. Provide the following or equivalent where natural lighting or existing building lighting does not meet the required light level:

- One 200-watt incandescent lamp per 1000 square feet of floor area, uniformly distributed, for general construction lighting, or equivalent illumination of a similar nature. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet. In stairways and at ladder runs, provide one lamp minimum per story, located to illuminate each landing and flight. Provide sufficient temporary lighting to ensure proper workmanship everywhere by the combined use of daylight, general lighting, and portable plug-in task lighting.
- Provide lighting in areas where work is being performed as required to supply a 100-foot candle minimum light level.

- Provide lighting in any area being subjected to visual inspection as required to supply a 100-foot candle minimum light level.

D. First Aid Supplies: Comply with governing regulations and recognized recommendations within the construction industry.

E. Fire Extinguisher: Provide Type "A" fire extinguisher for temporary offices and similar spaces where there is minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguisher or a combination of several extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

F. Installation:

a. Use qualified tradesmen for the installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the work.

b. Require that tradesmen accomplishing this work be licensed as required by the local authority for the work performed. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the project.

G. Emergency Lighting: Inside the work area/zone, provide services for emergency lighting in case of power failure.

H. Tools and Equipment:

a. Shovels used must be constructed of plastic or rubber.

b. Nylon bristle brushes may be used for cleaning. Under no circumstances will steel bristle brushes be allowed.

3.02.5 WORKER AND WASTE DECONTAMINATION SYSTEM FOR ACM ABATEMENT

A. The following requirements shall be followed for the worker decontamination unit:

a. At all ACM abatement projects, work areas shall be equipped with decontamination facilities consisting of a clean room, a shower room, and an equipment room.

b. The decontamination enclosure system chambers shall be constructed to meet the criteria of the Specification. The decontamination enclosure shall be installed watertight to prevent water leaks. The interior shall be lined with two layers of 6-mil fire-retardant plastic sheeting, with a minimum overlap of 16 inches at seams and sealed (airtight) by tape and adhesive. The interior floor shall be sheathed with (2) layers of reinforced fire retardant plastic sheeting with a minimum overlap on the wall of sixteen (16) inches. The contractor shall ensure compliance with local building codes and other regulations governing temporary structures.

c. Curtained Doorways: Three overlapping sheets of 6-mil polyethylene shall be placed over a framed doorway and secured along the top of the doorway. Secure the vertical edge of the outer sheets along one vertical side of the doorway and the vertical edge of the center

sheet along the opposite vertical side of the doorway. The sheets shall be weighted so that they close quickly after being released.

d. Air Locks: Airlocks shall consist of two curtained doorways placed a minimum of three feet apart.

- CleanRoom: In this room, persons remove and leave all street clothes and put on clean disposable coveralls. Approved respiratory protection equipment is stored in this area. The floor of the cleanroom must be kept dry at all times. At the end of each shift, the room must be cleaned using wet rags. Also, a lockable door may be installed. No asbestos-containing materials are allowed in this room. The cleanroom shall be equipped with suitable hooks, lockers, shelves, etc. for workers to store personal articles and clothing. **THIS IS NOT A CONTAMINATED AREA.**
- Shower Room: Provide a completely watertight operational shower to be used by cleanly dressed workers heading for the Work area from the cleanroom or for showering workers headed out of the Work Area after dressing in the Equipment Room. The shower must be constructed so that water leakage is minimized. The shower shall have one shower per six full shift abatement people, calculated on the basis of the largest shift. Any leaking water must be cleaned immediately. Showers must be equipped with hot and cold running water, soap and sufficient disposable towels for the number of workers at the job site. Arrange water shut off and drain pump operation controls so that a single individual can shower without assistance from either inside or outside the Work Area. **THIS IS A CONTAMINATED AREA.**
- Pump waste-water into a polyethylene-lined 55-gallon drum located in the Work Area to be added to the ACM waste. If the water is allowed by the work treatment workers to be pumped into a drain, provide 20 micron and 5-micron wastewater filters in line to drain. Change filters at a minimum of once a day. Locate filters inside the shower unit, so that the shower pan catches the water lost during filter change.
- Equipment Room: Work equipment, footwear, and all other contaminated work clothing are to be left here upon exiting Work Area. A walk-off pan filled with water shall be located in the work area just outside the equipment room for workers to clean foot coverings while exiting the work area. This is a change and transit area for workers. Provide a drop cloth layer of sheet plastic on the floor of the Equipment Room for every shift change. Roll drop cloth layer in upon itself at the end of each shift and dispose of as contaminated waste. **THIS IS A CONTAMINATED AREA.**
- Each room shall be separated from the other and from the work area by airlocks such as will prevent the free passage of air or ACM fibers and shall be accessible through doorways protected with three (3) overlapping 6 mil polyethylene sheets which shall be weighed, so as to fall into place when people pass through the area. The shower room shall be contiguous to the cleanroom and equipment room. All personnel entering or leaving the work area shall pass through the shower room. The number of showers provided shall satisfy the requirements of OSHA 29 CFR 1910.141. Hot and cold water shall be supplied to the showers. The equipment room (dirty room) shall be situated between the shower room and the work area and separated from both by means of suitable barriers or overlapping flaps such as will prevent the free passage of air or ACM fibers.
- Decontamination chamber doors shall be of sufficient height and width to enable replacement of equipment, which may fall, and to safely stretcher or carry an injured worker from the Property without destruction of the chamber or unnecessary risk to

the integrity of the work area. Such doors must be at least four (4) feet wide, and the distance between sets of doors must be at least four (4) feet.

e. No person or equipment shall leave the ACM abatement project work area unless first decontaminated by showering, wet washing or HEPA vacuuming to remove all ACM debris. No asbestos-contaminated materials or persons shall enter the cleanroom.

f. Where feasible, decontamination systems shall abut the work area. In situations where it is not possible, due to unusual conditions, to establish decontamination systems contiguous to the work area, personnel shall be directed to remove visible ACM debris from their persons by HEPA-filtered vacuuming prior to donning clean disposable coveralls while still in the work area and proceeding directly to a remote decontamination system to shower and change clothes.

g. In specific situations where the asbestos contractor determines that it is not feasible to establish a contiguous decontamination system at a worksite, the asbestos contractor shall utilize a remote decontamination system. Such systems must be operated in conformance with 29 CFR 1926.1101, Appendix F.

B. Remote Decontamination Facility

The Contractor shall provide a remote personnel decontamination enclosure system as specified above in section 4.05 A.

3.02.6 WORK AREA PREPARATION

A. General Work Place Preparation Requirements: The following procedures shall be followed during the conduct of abatement activities on large ACM projects:

a. The Contractor shall provide proper notification as approved by the Owner and as required under Section 1.03 of this specification.

b. No ACM abatement work including preparation shall be performed or continued without having a certified supervisor at the work area.

c. Provide and display danger signs at every entrance to the work areas in clearly visible locations indicating that ACM removal work is being conducted and unauthorized and not protected persons should not enter.

d. Danger signs must use the following legend:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

e. The worker decontamination enclosure system shall be installed or constructed prior to or before disturbing ACM.

f. The Contractor shall be responsible for cleaning up any visible excrement from birds, animals, etc. in the work areas prior to the preparation of the abatement work areas.

l. Abatement shall not commence until workplace preparation has been completed.

m. Emergency and fire exit routes from the work areas shall be maintained, or alternative exits shall be established in accordance with applicable Code(s) and regulations.

n. Entrances to the PS&S Property that will not be used for worker entry or emergency exits shall be locked to prevent unauthorized entry.

3.02.7 CLEAN-UP PROCEDURES

A. Preliminary Clean-Up Procedures

The following clean-up requirements shall be followed during the conduct of abatement activities on ACM abatement projects:

a. Visible accumulations of loose asbestos-containing waste material shall be cleaned up:

- Whenever sufficient asbestos-containing waste material to fill a single leak-tight container of the type commensurate with the properties of asbestos-containing waste materials has been removed, or
- At the end of each work shift, whichever shall occur first. Removed material shall be maintained wet until cleaned up.

b. Visible accumulations of asbestos-containing waste material shall be containerized utilizing non-metallic dustpans and non-metallic squeegees or HEPA vacuums.

c. Metal shovels shall not be used to pick up or move accumulated asbestos-containing waste material or any other debris in the vicinity of isolation or surface barriers.

d. Accumulations of dust shall be cleaned off all surfaces of the work area on a daily basis, using HEPA vacuum or wet cleaning methods.

e. The waste decontamination enclosure system shall be wet cleaned twice-using wet cleaning methods upon completion of waste removal. When the worker decontamination enclosure shower room alternates as a waste container washroom, the shower room shall be washed immediately with cloths or mops saturated with a detergent solution prior to wet cleaning.

f. The worker decontamination enclosure system shall be wet cleaned/HEPA vacuumed, as appropriate, after each shift change and a meal break.

g. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.

3.02.8 ACM WASTE DISPOSAL

A. The Contractor shall package, label, and remove all ACM waste from the work area in accordance with New Jersey DEP regulations, all other applicable regulations, and as specified below. Packaging shall be accomplished in a manner that minimizes waste volume but ensures waste containers shall not tear or break.

B. ACM wastes may include building materials, insulation, disposable clothing and protective equipment, plastic sheeting and tape, exhaust systems or vacuum filters, contractor equipment, or other materials designated by state or local authorities which have been potentially contaminated with ACM and have not been fully cleaned.

C. Waste Labeling

a. Warning labels, having waterproof print and permanent adhesive in compliance with OSHA, EPA, and NJDEP/DOT requirements shall be affixed to or printed on the sides of all waste bags or transfer containers. Warning labels shall be conspicuous and legible, and contain the following words:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

b. In compliance with NESHAP, 40 CFR, Part 61.150, all waste containers or bags shall be labeled with the following generator information:

- Name of the waste generator
- Location of where waste was generated

D. Wetting of Waste: A fine water spray shall be used to keep the top layers of waste in containers thoroughly wet at all times. When a waste bag is full, air within the bags shall be evacuated with a HEPA equipped vacuum and be securely sealed with tape or other secure fastener.

E. Decontamination of Fiber Drums: The Contractor's use and decontamination of fiber drums shall be in accordance with all applicable codes and regulations.

F. Waste Container Storage: The container used for the storage of bagged contaminated waste shall be an enclosed dumpster. The dumpster shall have a solid metal roof, solid metal door with a padlock. As a minimum, line the cargo area with two layers of 6-mil polyethylene sheeting to prevent contamination from damaged or leaking containers. Floor sheeting shall be installed first and shall extend up the sidewall 24 inches minimum. Wall sheeting shall be overlapped and taped securely into place. No unbagged contaminated waste or non-ACM waste shall be stored in these dumpsters. Ensure that bags placed in dumpsters are undamaged. Warning signs shall be posted on the Dumpster in accordance with Sections 29 CFR 1926.1101 (k) (1) of the OSHA regulations.

G. Waste Removal Scheduling: All waste containers shall be decontaminated and removed from the Property before final cleanup is started and exclusion zone barriers are taken down.

H. Waste Transportation and Disposal

a. It is the responsibility of the Contractor to determine and ensure that the Contractor and his/her subcontractors comply with 1) current waste handling regulations and 2) the current regulations for transporting and disposing waste at the ultimate disposal landfill. The Contractor must comply fully with these regulations, and with all U.S. Department of Transportation, State, local, and EPA requirements.

b. The Contractor's waste hauler and disposal contractor shall maintain a valid hazardous waste transporter's permit and identification number; and obtain complete, and fully comply with any other local hazardous waste manifesting requirements.

c. Exercise care before and during transport to ensure that no unauthorized persons have access to the containerized ACW.

d. Do not transport ACW on open trucks. Treat and dispose of drums that have been contaminated as asbestos-containing waste.

e. A copy of ACW manifest forms shall be sent to the Owner after each disposal is completed and all required data and signatures have been inserted.

f. The Contractor shall return the original Disposal Certificate (landfill receipt) to the Owner within 10 working days of waste shipment from the Property.

3.02.9 ALTERNATE WORK PRACTICES

A. The Contractor shall submit an application for alternate work practices to the Owner or Owner’s engineers, and the NJ-DOL as applicable for any alterations, modifications or non-conforming methods intended for ACM removal. The Owner and the NJ-DOL may or may not approve proposed alternative work procedures. The alternative procedures shall be submitted in writing and in advance for review and shall provide equivalent or a greater measure of ACM emission control.

3.02.10 AIR MONITORING

A. General

The Contractor shall perform all required personal OSHA air monitoring and provide final clearance including visual inspection and air testing. Final clearances shall conform to re-occupancy criteria required by regulations. No individual shall reoccupy the work area of an ACM abatement project within a facility until compliance with the re-occupancy requirements is achieved.

B. Personal OSHA Monitoring

a. The Contractor is solely responsible for performing personal air monitoring as specified by the OSHA 29 CFR 1926.1101 and the OSHA Respiratory Protection Standard 29 CFR 190.34.

b. A minimum of 20% of all workers in each working category (i.e., gross removal, final clearance, etc.) must be monitored each day of ACM removal activities.

c. Phase Contrast Microscopy in accordance with NIOSH 7400 shall be used to analyze personal air samples. The Contractor shall arrange and pay for all the costs of the testing. Laboratories used shall be currently enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program or an equivalent recognized program.

d. Results of all OSHA monitoring shall be provided to the Owner within 24 hours after collection of the samples. Work may not be allowed to resume until the Owner receives OSHA monitoring results in a timely fashion.

C During Air Sampling

a. Contingency plan during abatement shall be implemented as described below. These are the minimum requirements that shall be enforced on an asbestos project. These requirements shall not limit the on site Monitor from instituting additional requirements, if necessary, for the prevention of asbestos release.

b. If the pressure differential drops below 0.01 inches w.c. **(*where applicable*)** the following procedures shall be implemented:
- The Contractor shall cease abatement activity in the work area.
- The Project Monitor and the Contractor supervisor shall investigate and evaluate the engineering controls and determine the source of the pressure loss.
- The Contractor shall institute corrective action such as additional sealing, critical barrier maintenance and construction, changing of exhaust unit filters, adjustment of make-up air, operation of additional exhaust units or other necessary measures to re-establish an acceptable pressure differential.

c. If the fiber levels outside the work area exceed 0.01 f/cc criterion, the following procedures shall be implements:
- The Project Monitor and the Contractor supervisor shall investigate and evaluate the engineering controls to determine the source of the high air level.
- An additional set of split samples shall be collected. If the result of the air samples is less than or equal to 0.01 f/cc the no further actions are necessary. If the result of the air sample exceeds 0.01 f/cc criteria, the Contractor, in consultation with the on site Project Monitor, shall choose the option of cleaning and retesting by PCM analysis or analyzing the split sample by TEM analysis. If the result of the TEM analysis exceeds 70 structures per square millimeter, cleaning activities shall be conducted.
- The decision as to the timing of the cleaning activity shall be made by the on site Project Monitor in consultation with the building Owner/Site Representative and the Contractor.
- Cleaning shall include, but not be limited to, wet wiping, HEPA vacuum, and misting the air. Cleaning the affected area shall be continued outside of abatement work zone and PCM sampling shall also be continued until the result in the area is equal to or less than 0.010 f/cc by either PCM or TEM analysis.

D. Post-Abatement Clearance Criteria and During Abatement Air Sampling

The Contractor shall request the Monitor to conduct final inspection upon completion of each ACM Exclusion Zone work Area.

a. This final inspection shall include a thorough visual inspection of the worksite and clearance air monitoring. A sufficient number of air samples shall be taken to be representative of the work area. The Monitor retained by the Owner shall perform the final clearance visual inspection.

b. The pumps shall be calibrated before and after the sample is collected.

c. For abatement actions greater than or equal to 160 square feet (SF), or greater than or equal to 260 linear feet (LF), clearance air sampling shall be conducted using Transmission Electron Microscopy (TEM) in accordance with 40 CFR 763.90(I)(3) and (4). For abatement actions, less than 250 LF/160 SF, collect five (5) air samples in each work area, which may be analyzed using NIOSH 74OO methodology.

d. During the abatement, air samples may be analyzed using PCM, in accordance with NIOSH method 7400.

e. Collect one sample for every 10,000 square feet of work area, with a minimum of five samples.

f. At a minimum, collect air samples at the following locations:

- Cleanroom, workers decontamination unit
- Holding area, Waste decontamination unit
- Within 5 feet of critical barrier(s)

g. If the results of outside air samples exceed the 0.01f/cc criterion, work shall be halted and a contingency plan implemented to identify and rectify the source of emission.

E. Monitoring During the Abatement

The State of New Jersey does not require that pre-demolition, non-Subchapter 8 work have air monitoring conducted during the course of the ACM abatement. However, it is recommended that all phases of ACM abatement be monitored either full-time or on a part-time basis in order to ensure the Contractor's compliance with the applicable State, Federal and local regulations and requirements and protect the Client from any unforeseen liabilities.

3.02.11.CONTINGENCY PLAN

.

A. Security shall be required as follows:

In high-risk areas, the Contractor shall provide a 24-hour security guard to ensure protection against damage or vandalism to separation barriers, engineering systems, monitoring devices, or other equipment.

3.02.12 POST-PROJECT CLOSE-OUT

A. The Contractor shall provide all required documentation as required by this specification once his/her work is complete, final clearances passed and asbestos waste disposed of. This should include, but not limited to, a bound copy of the daily log containing log of daily work activities, containment entry/exit logs, copy of recording manometer charts, waste shipment records, personal air monitoring laboratory reports, and chain-of-custody documentation, and project

completion certificate. Final payment shall not be made to the Contractor until all required documentation is submitted and verified.

B. The Contractor shall remove all equipment, tools, materials, and waste generated off the Property once all work is completed and approved by the Owner or Owner's Representative.

3.02.13 DEFINITIONS

The following general definitions are for terms that may be utilized or implied within this specification.

Adequately Wetted - "Adequately wetted" means sufficiently mixed or coated with water, amended water or an aqueous solution; or the use of a removal encapsulant to prevent dust emissions.

Air Exhaust (negative pressure) System - A portable, powered, local exhaust system equipped with HEPA filtration, capable of maintaining constant low-velocity air flow into the contaminated work area from adjacent, uncontaminated areas and capable of maintaining negative static air pressure under maximum filter load with respect to adjacent, uncontaminated areas.

Ambient Air Monitoring - "Ambient air monitoring" shall mean measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the work site.

Amended Water - "Amended water," means water to which a chemical wetting agent or removal encapsulant has been added to improve penetration.

Area Air Sampling - "Area air sampling" shall mean any form of air sampling or monitoring where the sampling device is placed at some stationary location.

Asbestos - "Asbestos" means the asbestos form varieties of actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite.

Asbestos Abatement - "Asbestos abatement" means the removal, encapsulation, enclosure, renovation, repair, demolition or other disturbance of asbestos-containing materials.

Asbestos Abatement Project - "Asbestos abatement project" means any asbestos abatement performed within a facility involving more than three (3) linear feet or three (3) square feet of asbestos-containing material.

Asbestos Abatement Worker - "Asbestos abatement worker" means any employee of an asbestos contractor who engages in asbestos abatement.

Asbestos Abatement Site Supervisor - "Asbestos Abatement Site Supervisor" means any individual who is employed or engaged by an asbestos contractor to supervise an asbestos abatement project.

Asbestos-Containing Material - "Asbestos-containing material" (ACM) means material composed of asbestos of any type and in an amount greater than one percent by weight, either alone or mixed with other fibrous or non-fibrous material.

Asbestos-Containing Waste - "Asbestos-containing waste" (ACW) shall mean asbestos-containing material that has been accumulated during-abatement activities as wells as asbestos-contaminated objects requiring disposal as ACW.

Asbestos Exclusion Zone - "Where co-mingled or other asbestos-containing material (ACM) has been delineated and loading of such material into lined containers or other direct impact is required, asbestos air concentration values are subject to evaluation; these areas shall be segregated from general site/property areas using temporary fencing with asbestos hazard signage and/or asbestos hazard tape; these areas require asbestos PPE, asbestos handler or other license(s).

Authorized Asbestos Disposal Facility - "Authorized Asbestos Disposal Facility" means a location licensed for handling and disposing of asbestos waste and approved by the Owner or Owner's representative.

Authorized Visitor - "Authorized visitor" shall mean the Owner and his/her representative, and any representative of a regulatory or other agency having jurisdiction over the project.

Certificate of Completion - A Certificate of Completion shall mean the document issued by the Contractor signifying that the asbestos has been removed from the building in conformance with applicable regulations.

Clean Room - "Clean room" shall mean an uncontaminated area or room, which is parts of the worker decontamination enclosure system with provisions for storage of workers' street clothes and clean protective equipment.

Clearance Air Monitoring - "Clearance air monitoring" shall mean the employment of aggressive sampling techniques with a volume of air collected to determine the airborne concentration of residual fibers, and shall be performed as the final abatement related activity.

Contractor - A Contractor means any person or entity, engaged in asbestos abatement work and is licensed by the New Jersey Department of Labor as an asbestos abatement contractor.

Construction Permit for Asbestos Abatement - A Construction permit for asbestos abatement means required official approval to commence any asbestos hazard abatement project. This permit is issued by the enforcing agency.

Critical Barrier - A Critical barrier means two layers of nominal six mil polyethylene sheeting that completely seals off the work area to prevent the distribution of fibers to the surrounding area, such as the opening between the top of a wall and the underside of ceiling construction, electrical outlets, non-removable lights, HVAC systems, windows, doorways, entranceways, ducts, grilles, grates, diffusers, wall clocks, speaker grilles, floor drains, sink drains, etc.

Decontamination Unit - A Decontamination unit means a serial arrangement of rooms or spaces for the purpose of separating the work area from the building environment upon entering the work area and for the cleaning of persons, equipment, and contained waste prior to returning to the clean environment.

Demolition - "Demolition" means the wrecking or taking out of any load-supporting structural member of a facility and any related razing, removing or stripping of a building.

DOT - "DOT" means the New Jersey Department of Transportation.

Emergency Asbestos Abatement Project - "Emergency Asbestos Abatement Project" - means an asbestos abatement project, which was not planned but results from a sudden unexpected event. This includes operations required by non-routine failures of equipment.

Employee - An Employee means an asbestos abatement worker having a valid work permit, issued by the New Jersey Department of Labor and employed by the Contractor.

Encapsulation - A Encapsulation means the treatment of asbestos-containing materials, with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers, as the encapsulant creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant).

Enclosure - Enclosure means the construction of an airtight, impermeable, permanent barrier around asbestos-containing material to control the release of asbestos fibers into the air.

Engineering Controls - Engineering Controls - means all methods used to maintain low fiber counts in work areas including, but not limited to, air management, barriers to ensure public safety and methods to confine airborne asbestos fibers to the work area.

EPA - "EPA" means the U.S. Environmental Protection Agency.

Equipment Room - "Equipment room" shall mean a contaminated area or room which is part of the worker decontamination enclosure system used for the storage of contaminated clothing and equipment.

Flame-Resistant Polyethylene Sheet - Flame-Resistant Polyethylene Sheet - means a single polyethylene film in the largest sheet size possible to minimize seams, nominal six mils thick, conforming to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-Resistant Textiles and Films.

Friable Asbestos-Containing Material - "Friable asbestos-containing material" means any asbestos-containing material that hand pressure can crumble, pulverize, or reduce to powder when dry and non-friable asbestos-containing material that potentially can be broken, crumbled, pulverized or reduced to powder as a result of asbestos abatement.

Glove Bag - "Glove Bag" means a manufactured polyethylene bag type of enclosure with built-in gloves, such as is placed with an air-tight seal around asbestos-containing material and which permits the asbestos-containing material contained by the bag to be removed without releasing asbestos fibers to the atmosphere.

HEPA Filter - "HEPA filter" shall mean a high-efficiency particulate air filter capable of trapping and retaining 99.97 percent of particles (asbestos fibers) greater than 0.3 micrometers mass median aerodynamic equivalent diameter.

HEPA Vacuum Equipment - "HEPA vacuum equipment" shall mean vacuuming equipment with a high-efficiency particulate air filter capable of trapping and retaining 99.97 percent of particles (asbestos fibers) greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.

Holding area - "Holding area" shall mean a chamber in the equipment decontamination enclosure located between the washroom and an uncontaminated area.

Individual - "Individual" means any human being.

Movable Object - "Movable object" shall mean a unit of equipment or furniture in the work area which can be removed from the work area.

MSHA - "MSHA" shall mean the Mine Safety and Health Administration

NESHAP - "NESHAP" shall mean the National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61).

NIOSH - "NIOSH" shall mean the National Institute for Occupational Safety and Health 4676 Columbia Parkway, Cincinnati, OH 45226.

Non-Friable Asbestos-Containing Material - Non-Friable Asbestos-Containing Material" means any asbestos-containing material that hand pressure cannot crumble, pulverize or reduce to powder when dry.

OSHA - "OSHA" means the Occupational Safety and Health Administration of the U.S. Department of Labor.

Person - "Person" means any individual, corporation, partnership, firm, association, sole proprietorship, the State of New Jersey or any of its political sub-divisions, or any other entity.

Personal Protective Equipment - "Personal protective equipment" (PPE) shall mean appropriate protective clothing, gloves, eye protection, footwear; headgear and approved respiratory protection.

Phase Contrast Microscopy - "Phase Contrast Microscopy" (PCM) shall mean the measurement protocol for the assessment of the fiber content of air by NIOSH Method 7400.

Polarized Light Microscopy - "Polarized Light Microscopy" (PLM) shall mean the measurement protocol for the assessment of the asbestos content of bulk materials by Interim Method for the Determination of Asbestos form Materials in Bulk Insulation Samples-40 CFR Part 763, Subpart F, Appendix A as amended on September 1, 1982.

Qualitative Fit Test - "Qualitative fit test" shall mean the individual test subject's responding, either voluntarily or involuntarily, to a chemical challenge outside the respirator facepiece.

Quantitative Fit Test - "Quantitative fit test" shall mean exposing the respirator wearer to a test atmosphere containing an easily detectable, non-toxic aerosol, vapor or gas as the test agent. Instrumentation, which samples the test atmosphere and the air inside the facepiece of the respirator, is used to measure quantitatively the leakage into the respirator.

Removal - "Removal" means the taking out or stripping of any asbestos-containing materials from surfaces or structural components of a facility and proper and legal disposal of such material.

Renovation - "Renovation" means altering, in any way other than demolition, one or more structural components. Operations in which load-supporting structural members are taken out are excluded.

Repair - "Repair" means the restoration of damaged asbestos-containing material; including but not limited to the sealing, patching, enclosing or encapsulating or damaged asbestos-containing material to prevent fiber release.

Shower Room - "Shower room" shall mean a room between the cleanroom and the equipment room in the worker decontamination enclosure with hot and cold running water controllable at the tap and arranged from complete showing during decontamination.

Spot Repair - "Spot Repair" means any asbestos abatement performed within a facility involving not more than three (3) linear feet or three (3) square feet of asbestos-containing material.

Structural Component - "Structural Component" means any pipe, duct, boiler, tank, reactor turbine, furnace or other components at or in a facility or any structural member of a facility.

Structural Member - "Structural member" means any load-supporting member of a facility such as beams and load-supporting walls.

Surface Barriers - "Surface barriers" shall mean the plasticizing of walls, floors, and fixed objects within the work area to prevent subsequent contamination from abatement work.

Surfactant - "Surfactant" shall mean a chemical wetting agent added to water to improve penetration.

Transmission Electron Microscopy (TEM) - "Transmission Electron Microscopy (TEM)" shall mean the measurement protocol for the assessment of the asbestos fiber content of air by Interim Transmission Electron Microscopy Analytical Methods-40 CFR Part 763, Subpart E, Appendix A.

Universal Waste - "Other regulated waste (fuel oil, batteries, etc.) that has to be further segregated from debris and asbestos waste streams.

Visible Emissions - "Visible emissions" shall mean any emissions containing particulate material that are visually detectable without the aid of instruments.

Visible Residue - "Visible residue" means any debris or dust on surfaces in areas within the enclosed work area where asbestos abatement has taken place and which is visible to the unaided eye. All visible residues are assumed to contain asbestos.

Washroom - "Washroom" shall mean a room between the work area and the holding area in the equipment decontamination enclosure system where equipment and waste containers are wet cleaned and/or HEPA vacuumed prior to disposal.

Waste Decontamination Enclosure System - "Waste decontamination enclosure system" shall mean the decontamination enclosure system designated for the controlled transfer of materials and equipment, consisting of a washroom and a holding area.

Water Column (W.C.) - W.C. shall mean a unit of measurement for pressure differential.

Wet Cleaning - "Wet cleaning" shall mean the removal of asbestos fibers from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with amended water.

Wet Methods - "Wet methods" shall mean the use of amended water or removal encapsulant to minimize the generation of fibers during ACM disturbance.

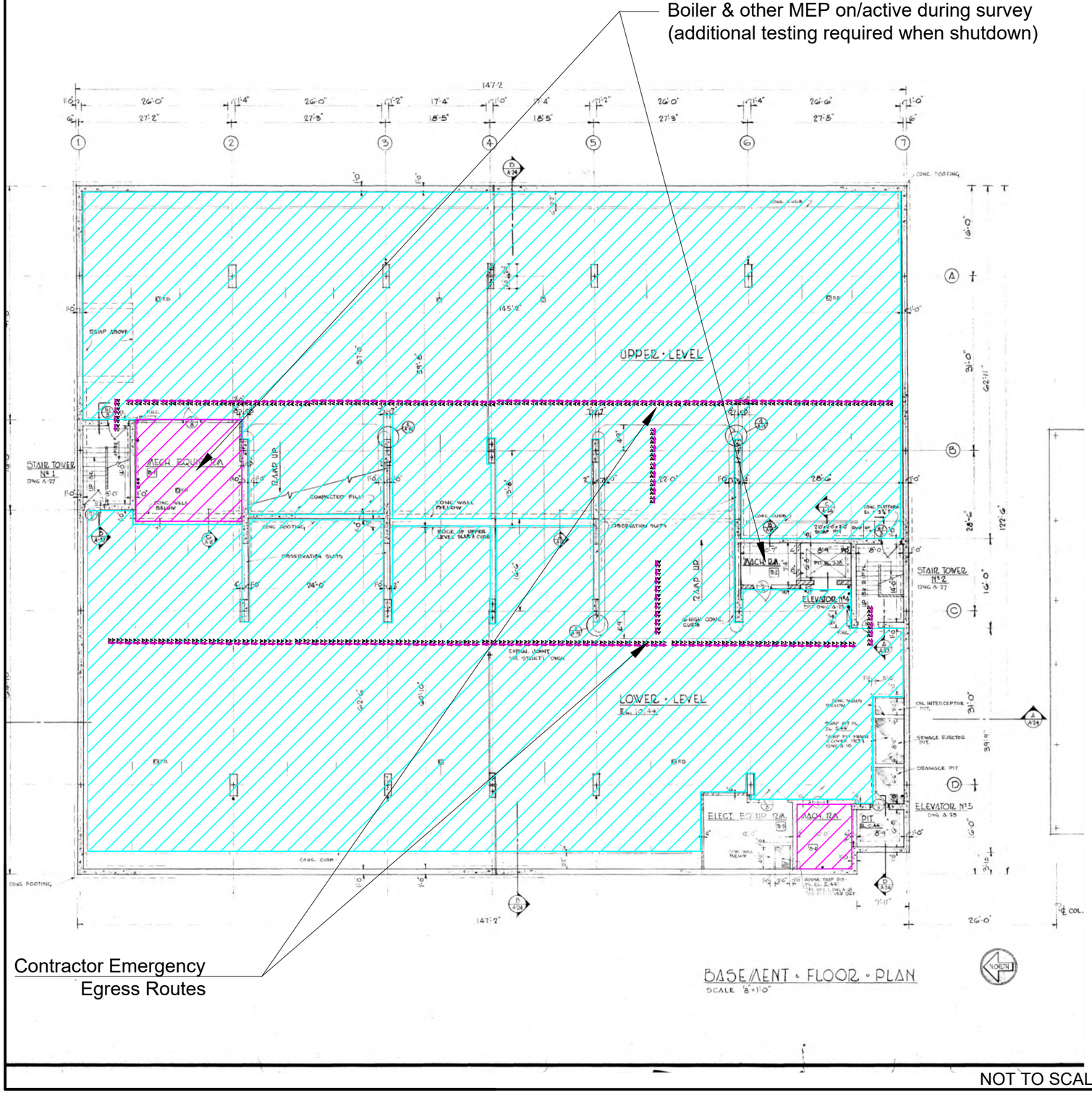
Work Area - "Work area" means the specific area or location where the actual asbestos abatement work is being performed or such other areas of a facility which may be hazardous to public health as a result of such asbestos abatement.

Worker - "Worker" shall mean asbestos handler and/or asbestos handler supervisor.

Worker Decontamination Enclosure System - "Worker decontamination enclosure system" shall mean that portion of a decontamination enclosure system designed for controlled passage of workers, and other individuals and authorized visitors, consisting of a clean room, a shower room, and an equipment room separated from each other and from the work area by airlocks and curtained doorways.

END OF SECTION

BASEMENT



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	Basement	Sprinkler room	Fittings	3 ln. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Elevator Room	Fittings	3 ln. ft.		
		Throughout	Ceiling & Wall Texture/Stucco	14, 500 sq. ft.		
		Concealed boiler + other MEP ACM (gasket, etc.)			TBD once equipment shutdown	
** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition						

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

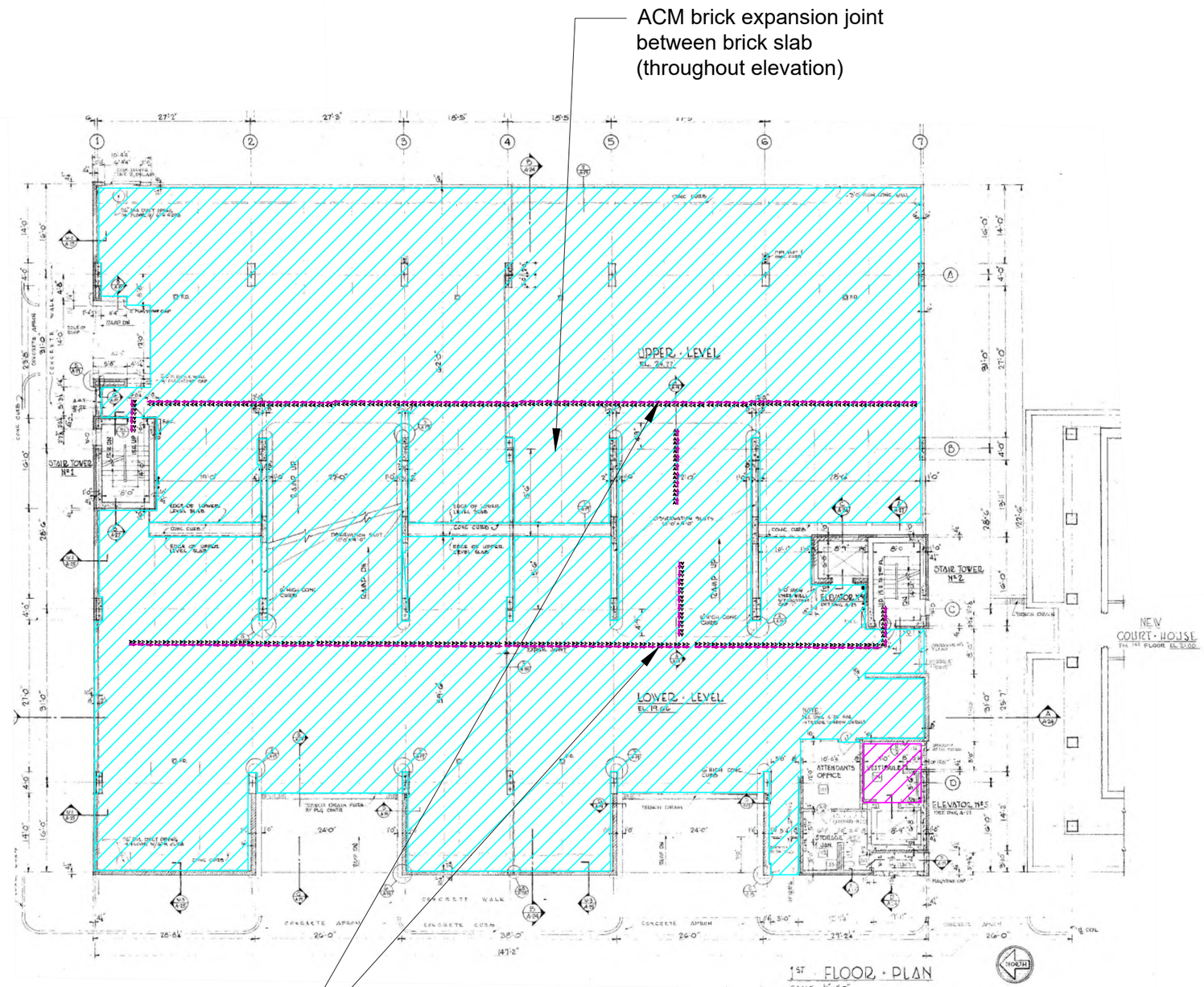
Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 01 of 09

1ST FLOOR



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location: Floor/ Elevation	Location: Area	Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
Parking Garage	1	Security control bath	Fittings	2 ln. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Ceiling Texture/Stucco	14,000 sq. ft.		
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

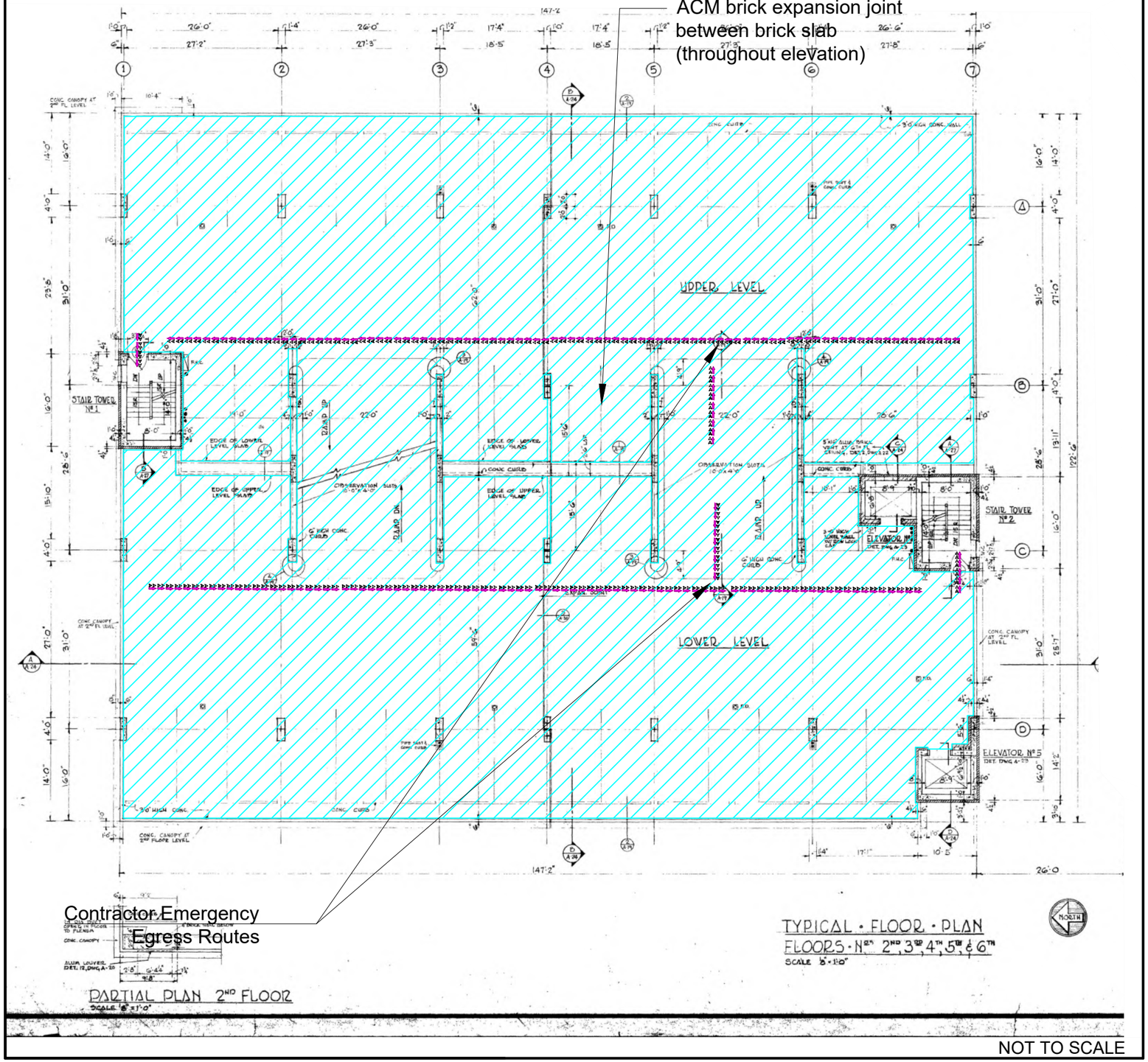
Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

Date:5/10/2021

Project. #: 21-S8-102-2

Drawing #: 02 of 09

2ND FLOOR (TYPICAL LAYOUT FLOORS 2-6)



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	2	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

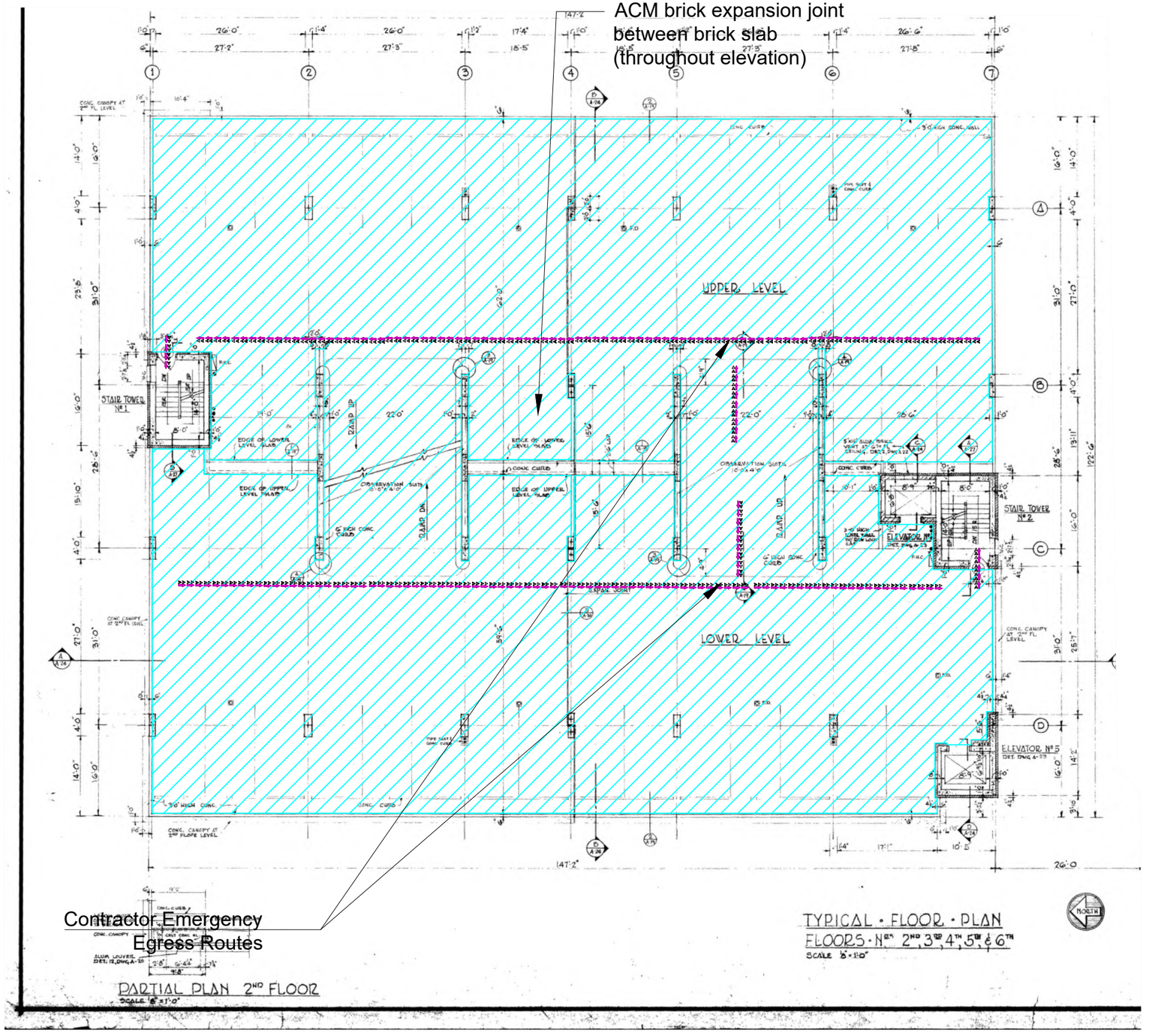
Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 03 of 09

3RF FLOOR (TYPICAL LAYOUT FLOORS 2-6)



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	3	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

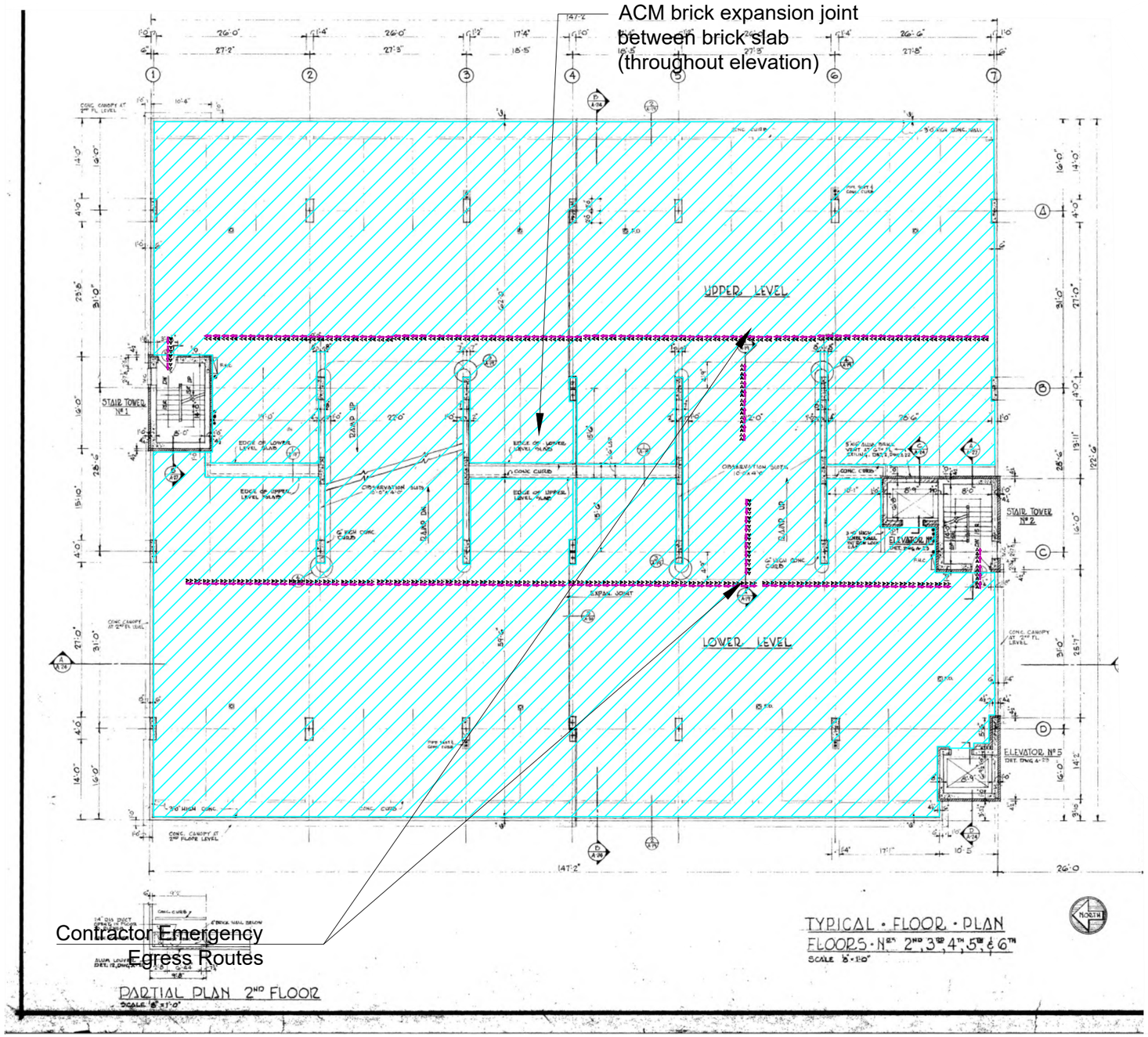
Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 04 of 09

4TH FLOOR (TYPICAL LAYOUT FLOORS 2-6)



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	4	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		

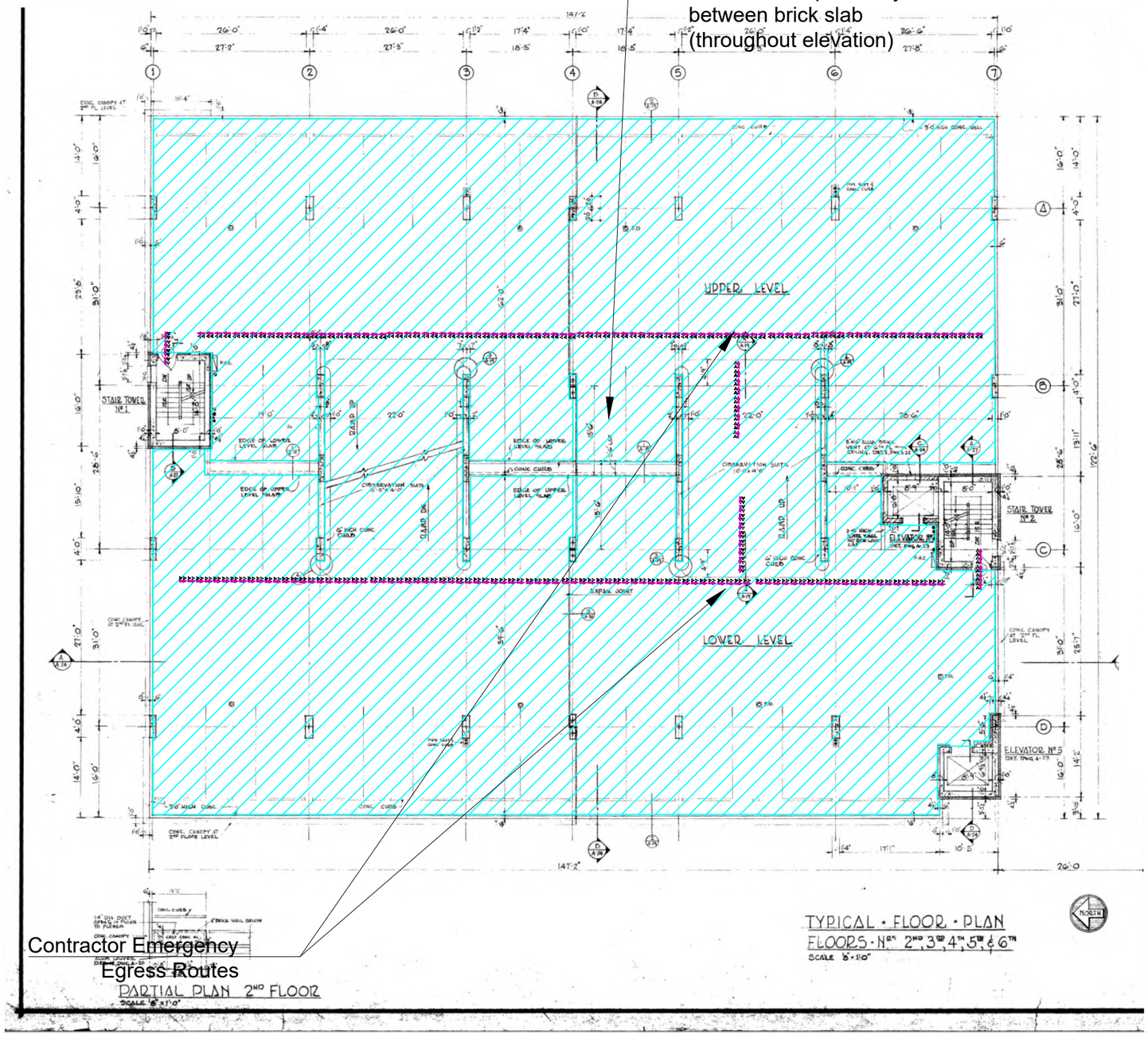
** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title:	Asbestos Abatement Specification Plan
Client:	Paulus, Sokolowski & Sartor, LLC
Location:	Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

Date:5/10/2021
Project. #: 21-S8-102-2
Drawn By: Stan Blackman
Drawing #: 05 of 09

5TH FLOOR (TYPICAL LAYOUT FLOORS 2-6)



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	5	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

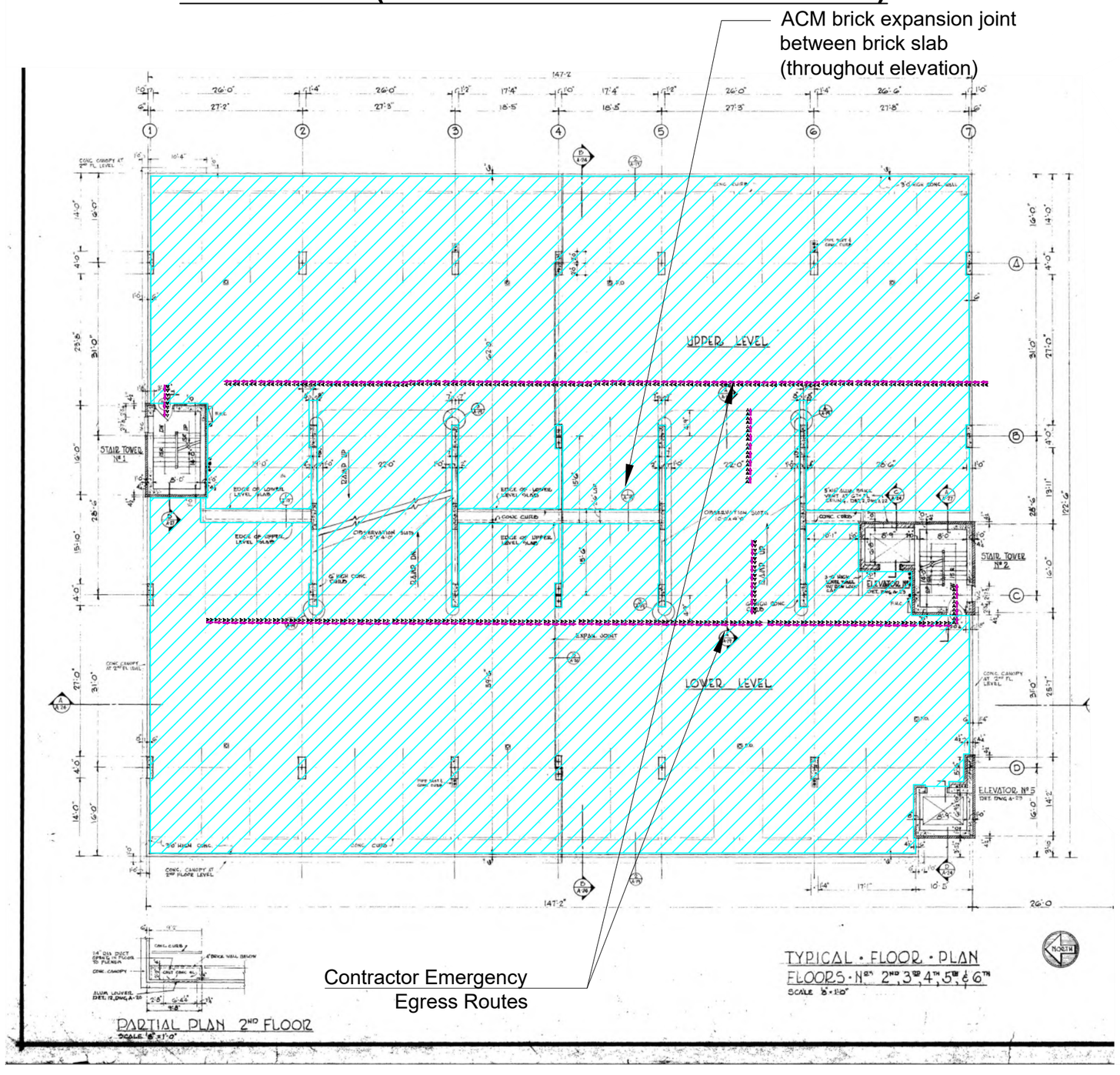
Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 06 of 09

6TH FLOOR (TYPICAL LAYOUT FLOORS 2-6)



NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	6	Throughout	Ceiling Texture/Stucco	14,000 sq. ft.	NJDCA Sub-8 Asbestos Procedures	Variance may be required
		Throughout	Brick Expansion Joint	32 ln. ft. (visible)**		
** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition						

Dwg. Title:	Asbestos Abatement Specification Plan
Client:	Paulus, Sokolowski & Sartor, LLC
Location:	Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

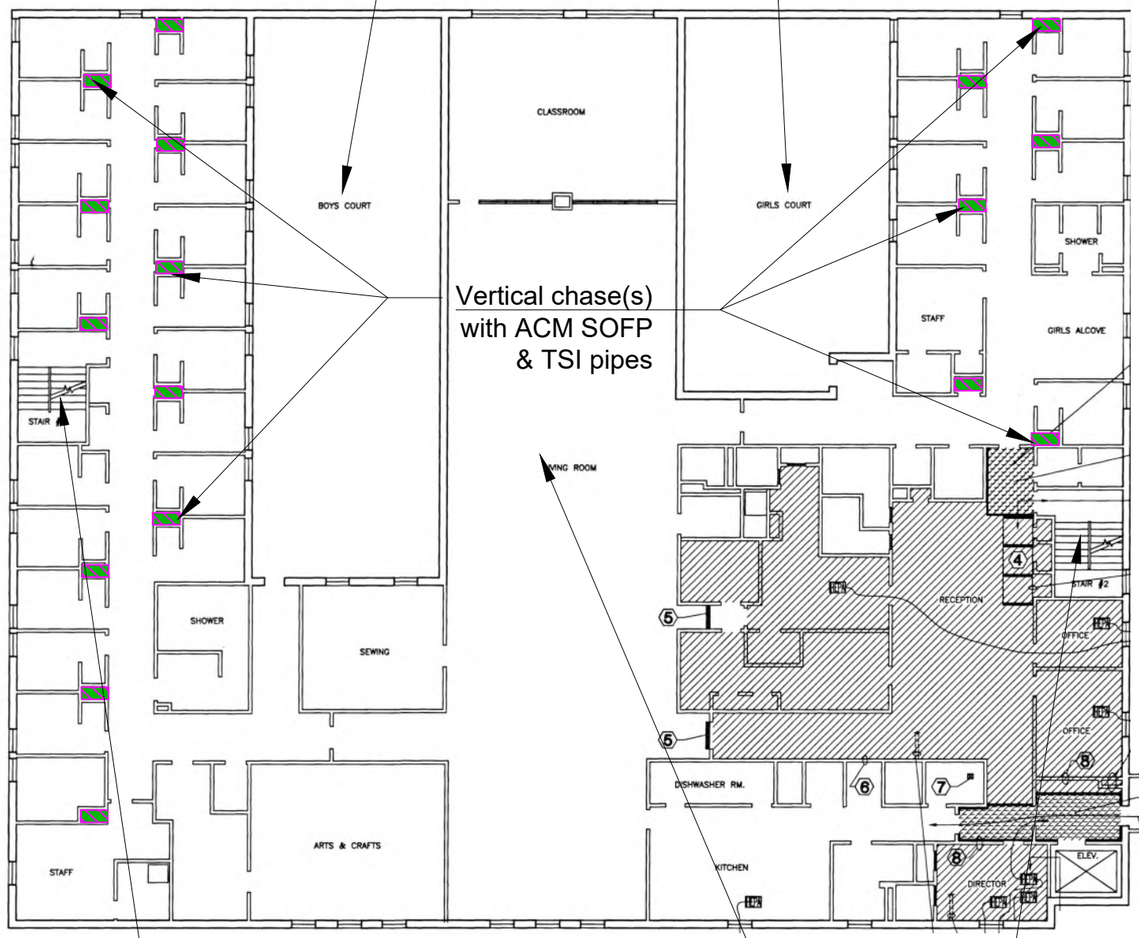
Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

Date:5/10/2021
Project. #: 21-S8-102-2
Drawn By: Stan Blackman
Drawing #: 07of 09

7TH FLOOR

No access to roof top courtyard during survey (to be inspected for ACM)

In order for project classification to remain "non sub chapter-8", connecting walkway needs to be sealed airtight.



Vertical chase(s) with ACM SOFP & TSI pipes

ACM SOFP may exist above metal plate ceiling throughout 7th floor (to be confirmed when metal plating can be removed)

Contractor Emergency Egress Routes

NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location: Floor/ Elevation	Location: Area	Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
Parking Garage	7	Plumbing chase(s)	SOFP	2,300 sq. ft. (throughout)	NJDCA Sub-8 Asbestos Procedures	Variance may be required
	7	Exterior Facade	Brick Expansion Joint	Throughout		
Parking Garage	7	Roof top prison yard(s)	Roofing	No access	Exterior roof procedure	Additional testing required when exposed and can be safely accessed
	7	Windows	Caulking/ glazing	No access	TBD	

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

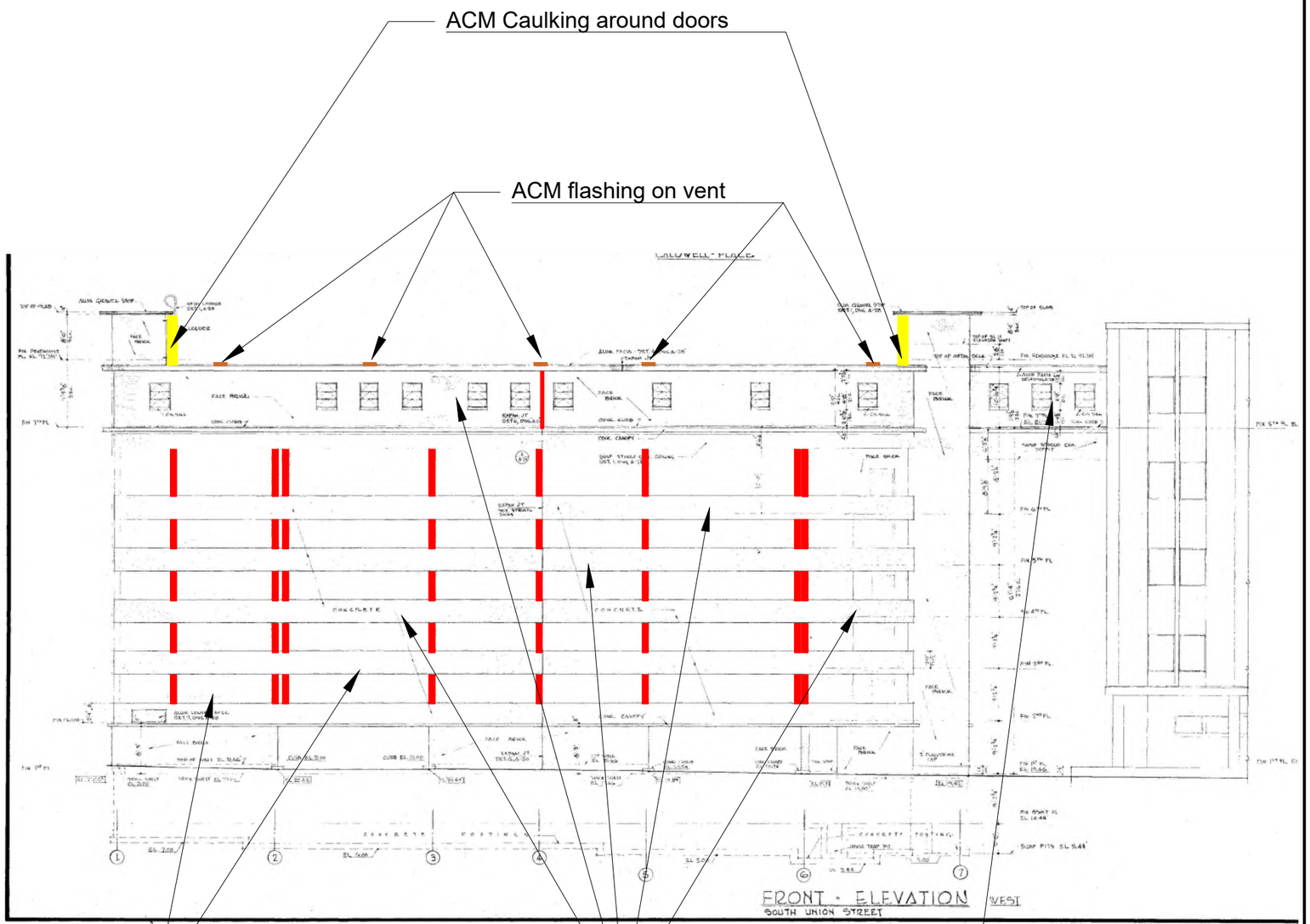
Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 08 of 09

Building/Structure Exterior



Selective demolition of facade required ***"throughout"*** to confirm if any concealed ACM may exist

In order for project classification to remain "non sub chapter-8", connecting walkway needs to be sealed airtight.

NOT TO SCALE

Abatement Notes:

1. Since the subject building is associated with a County facility N.J.A.C. 5:23 Subchapter 8 requirements could apply and be enforced by the on-site Asbestos Safety Technician (AST) working for an Asbestos Safety Control Monitoring (ASCM) firm (non-occupied building status 5.23-8.19) - See notes on job classification, provide pricing for both options.
2. The Subject structure/building "Elizabethtown Parking Garage" to remain unoccupied during the abatement period (maintenance/plumber/electrician are exempt). Adjoining New Annex to remain occupied.
3. The objective of the project is to perform 100% removal of all ACM in the Parking Garage prior to demolition, with possible removal of expansion joint ACM during demolition (NJDCA or NJDOL variation likely required).
4. Abatement Contractor to establish a safe work zone perimeter. Once established and demolition work commences, only license/trained personnel are permitted to enter the work zone(s).
5. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Abatement of asbestos-containing materials that are being facilitated by selective demolition, may require NJDCA or NJDOL Variance approval. The Contractor shall be responsible for the preparation, submittal, and including all filing fees associated with any Site-Specific Variances.
6. Use of PPE is required at all times when entering and/or entering the worksite.
7. (ACM stucco and SOFP throughout 7th floor on beams/decks/columns except where patched) Because the Parking Garage is exposed to open air, extensive abatement containment wall building will be required to achieve negative pressure for ACM stucco removal. The 7th floor SOFP/ACM abatement areas are currently enclosed.
8. Related to use of the upper floor of the parking garage structure as juvenile prison space, there is a solid continuous metal ceiling above the sheetrock ceiling that has to be cut to access ACM for abatement (exact thickness unknown).
9. (Saw or torch cutting of 7th floor metal prison ceiling) - Due to very limited viewing of the concealed metal ceiling, additional probe cuts and/or selective demolition is required to determine if lead-based paint (LBP) potentially exists, where pre-stripping of cut points could be required for "OSHA Lead in Construction Standard (21 CFR 1926.62) compliance.
10. Exterior façade/soffits and/or other components to be checked for additional ACM SOFP including stucco, vapor barrier, or other concealed behind slab edges where they meet columns and/or other locations. Selective exterior/interior façade demolition will likely be required to access all concealed ACM.
11. (ACM Expansion Joints) - Because ACM expansion joint material is not fully accessible (jammed between façade sections)' full removal of this material may have to be conducted during structural demolition phase(s).
12. (Vertical Enclosed Mechanical Chases on 7th floor) - Enclosed mechanical chases with ACM/TSI and ACM SOFP were identified on the 7th floor (see prison cell layout drawings with chase highlighted).
13. (Tracing of MEP down from 7th floor prison floor through parking garage levels to basement) Because the parking is not heated or cooled, it is most likely that utilities were routed from the basement to the 7th floor prison level via large single or double shafts (7th floor vertical chases not traced down through 1-6).
14. (Layered Roof Membranes) - Up to six (6) layers of non-ACM roof field with positive ACM roof flashing - two (interior) roof top prison Girls and Boys courtyard areas not accessible during asbestos survey still requires testing.
15. Once abatement is completed, the Demolition Contractor can proceed with the removal of Universal Waste and demolition of the structure/building.
16. Once verified that no suspect ACM remaining, Demolition Contractor to then proceed with demolition activities.

LEGEND:

- Waste Route
- AFD Units & Exhaust
- Emergency Egress Routes
- Worker/Waste Decon
- Sprayon Fire Proofing (SOFP)
- Brick Expansion Joint
- Caulking around Doors
- Ceiling Texture/Stucco
- TSI Fittings
- Vent Flashing Bottom Layer
- Wall Texture/Stucco

Table 1: CONSOLIDATED APPROXIMATE ACM QUANTITY SCOPE OF WORK SUMMARY

Building	Location		Description of ACM	Estimated Removal Quantity	Method of Abatement	Additional Notes
	Floor/ Elevation	Area				
Parking Garage	Main Roof	Roof	Vent flashing	300 sq. ft. (5 vents)	Exterior roof procedure	Variance may be required
	Main Roof	Roof	Door caulking	2 doors	Non friable	

** ACM Expansion Joint material is layered between façade sections. Complete access and removal of this ACM may have to be coordinated with demolition

Dwg. Title: Asbestos Abatement Specification Plan

Client: Paulus, Sokolowski & Sartor, LLC

Location: Union County Caldwelll & Elizabethtown Parking Deck, Elizabeth NJ 07201

Omega Environmental Services
280 Huyler Street
S. Hackensack, NJ 07606

Date:5/10/2021

Project. #: 21-S8-102-2

Drawn By: Stan Blackman

Drawing #: 09 of 09

PRE-DEMOLITION ASBESTOS ABATEMENT BID PROPOSAL

BID PROPOSAL FOR ELIZABETHTOWN PARKING GARAGE

UNION COUNTY ELIZABETHTOWN PARKING GARAGE ABATEMENT PROJECT
(ABATEMENT START DATE - *TBD*)

CONTRACTOR NAME/ADDRESS: _____

CONTRACTOR PHONE #/EMAIL ADDRESS: _____

PLEASE SUBMIT THE SUBJECT BID TO CONTACT NAME/EMAIL
(TO BE CONFIRMED BY THE CLIENT)

BIDS TO BE EMAILED TO COUNTY REPRESENTATIVE

The below listed "lump sum" pricing shall include the cost of all mobilization, filing, and other fees. Since the scope of work has been clearly defined and the areas are accessible and visible for Contractor field verification no change orders will be considered. If the work is not completed within the specified timeframe the Contractor may be subject to penalties. Client reserves the right to terminate the contract at any time if adequate resources in terms of labor and equipment are not provided to reasonably meet the scheduling requirements with a margin of safety.

Base Bid (lump sum)	
Removal of all ACM as specified in bid documents and discussed during a pre-bid walkthrough.	
Option 1: Removal of **"ALL"** ACM including selective demolition to access any concealed material utilizing "NJDCA - Non-Occupied Sub Chapter 8 procedures", as per the Specifications and discussed during the walkthrough	**$**_____
Option 2: Removal of **"ALL"** ACM including selective demolition to access any concealed material utilizing "NJDOL procedures", as per the Specifications and discussed during the walkthrough	**$**_____
Unit costs	
Removal of additional minor quantities, including mobilization, abatement, and disposal of less than 25 ln. ft. /10 sq. ft. of ACM	$_____
Removal of additional small quantities of ACM, including abatement and disposal of ACM	$_____/tent
Fire Guard (if required)	$_____
Demolition of additional plaster/masonry wall in order to access concealed materials **outside of base bid work area**. Includes disposal costs.	$_____/sq. ft.
Additional Disposal Costs	$_____
Mobilization fee	$_____
* **Contractor shall verify SOW prior to Bid submittal**	
Please list any exclusions, clarifications, and/or concerns you have about the current scope of abatement work, as well as any RFI"s	

The undersigned hereby acknowledges that he has fully examined and accepts all technical specifications, Union County contract, and agrees to all conditions set forth and including all items as listed in the project work plan and any addenda, and is familiar with all site conditions affecting the work. All labor, materials, filing fees, and/or other items required for the satisfactory completion of the work shall be provided for the above-listed bid price.

AUTHORIZED REPRESENTATIVE NAME/SIGNATURE: _____

DATE: _____

CITY OF ELIZABETH, NEW JERSEY
DEPARTMENT OF NEIGHBORHOOD SERVICES
BUREAU OF CONSTRUCTION
50 Winfield Scott Plaza, Elizabeth, NJ 07201-2462
Phone (908) 820-4093 Fax (908) 820-4245
www.Elizabethnj.org

J. CHRISTIAN BOLLWAGE
MAYOR

RAYWANT P. SARRAN
CONSTRUCTION OFFICIAL

DEMOLITION CHECKLIST

THE FOLLOWING LIST OF REQUIREMENTS MUST BE MET BEFORE A DEMOLITION PERMIT CAN BE ISSUED:

1) A certification from an ***ENVIRONMENTAL AGENCY*** attesting to the status of asbestos disturbance.
2) Proof of buried tank removal or closure.
3) Proof of disconnection and removal of appurtenances from ***Water Company.***
4) Proof of disconnection and removal of appurtenances from ***Electric Utility Company.***
5) Proof of disconnection and removal of appurtenances from ***Gas Company;***
6) Proof of disconnection and removal of appurtenances from ***Cable Company and Telephone Company.***
7) Sewer line must be capped off. ***(Plumbing Permit Required)***
   a) *Inspection of cap off must be conducted by* ***Plumbing Inspector*** *prior to demolition.*
8) *Certificate of Abatement for pest control treatment.*
   a) *Compliance certificate must be obtained from the* ***Health & Human Services Department***
9) *Neighboring property owners must be notified at least* **fourteen** *(14) days prior to the commencement of demolition by regular and certified mail. Proof of notification to neighbors is required by this office.*
10) *Use of cutting torch – Permit required from* ***Elizabeth Fire Prevention Bureau*** **(908) 820-4040.**
11) *Footings, foundations and slabs must be removed and inspected before clean fill is installed.*
12) *Site must be left with grade the same as grounding grade.*
13) *Must Provide* ***TEMPORARY FENCE*** surrounding the entire demolition area. Silt fence or bails of straw.
14) *A dumpster must be placed on site during the entire demolition process & removed within 24 hours after completion.*
15) *Sidewalks must be kept in safe condition at all times, in the discretion of the Bureau of Construction & must be free of debris and must not hinder or obstruct the pedestrian traffic.*
16) *A portable toilet facility must be located on site and maintained in a sanitary condition for the duration of the demolition and must be removed within 24 hours after the completion of the demolition.*

PHONE NUMBERS:

AMERICAN WATER COMPANY	(800) 272-1325 Press # 4 – speak w/ Representative
PUBLIC SERVICE ELECTRICAL DEPT. (PSE&G)	(800) 817-3366 Mon.-Fri. 8:00 AM – 3:30 PM
ELIZABETHTOWN GAS COMPANY	(800) 242-5830 Ask for a "Representative"

PERMIT FEE SCHEDULE:

One & Two family dwellings	**$ 75.00**	**+ $65.00** *Plumbing*
Multiple dwellings	**$ 100.00**	
Commercial & Industrial	**$ 150.00**	
Accessory Structures	**$ 50.00**	

New Construction Requirements:

- All permit applications
- Builder's License
- Two (2) sets of signed & sealed architectural plans
- Zoning Approval Letter OR Planning / Zoning Board Resolution
- Current Survey of Property
- Soil Compaction Report *(If Demolition occurred)*
- Soil Conservation Letter *If lot size is over 5,000 feet (908) 526-2701)*
- Sewer Permit *(Engineering Dept. 3rd Floor, 908-820-4271 (Letter from plumber required if using exiting sewer)*

Application for New Construction Certificate of Occupancy must be accompanied by:

- *Home Warranty, New Property Survey*

APPENDIX 3

TEMPORARY TRAFFIC CONTROL PLAN

LEGEND

- WORK AREA
- TYPE 3 BARRICADE
- CHANNELIZING DEVICE
- TEMPORARY BARRIER W/ WARNING LIGHTS

UNION COUNTY GARAGE

RENOVATION

CITY OF ELIZABETH UNION COUNTY NEW JERSEY

TEMPORARY TRAFFIC CONTROL PLAN CONCEPT

CALDWELL PLACE AND BOLLWAGE GARAGE

TRAFFIC AND PARKING CONSULTANTS
HIGHWAY AND SIGNAL DESIGN
MICHAEL MARIS ASSOCIATES, INC.

ARISTOTLE SPYROPOULOS
PROFESSIONAL ENGINEER N.J. LIC. NO. GE36088

SCALE:	N.T.S.
DATE:	01-12-21
PROJECT:	20-247
FILE:	m-proposed.dwg
SHEET:	1 / 1

UNION COUNTY PARKING DECK

AT CALDWELL PLACE AND ELIZABETHTOWN PLAZA

ELIZABETH, NJ 07202

UNION COUNTY BOARD OF COUNTY COMMISSIONERS

CHAIRMAN: ALEXANDER MIRABELLA
VICE CHAIR: REBECCA WILLIAMS
COMMISSIONER: ANGELA R. GARRETSON
COMMISSIONER: SERGIO GRANADOS
COMMISSIONER: CHRISTOPHER HUDAK
COMMISSIONER: BETTE JANE KOWALSKI
COMMISSIONER: LOURDES M. LEON
COMMISSIONER: KIMBERLY PALMIERI-MOUDED
COMMISSIONER: ANDREA STATEN

CONSULTANTS:

CONSTRUCTION MANAGER

LEHRER CUMMING
200 SOUTH AVENUE EAST, SUITE 302
CRANFORD, NJ 07016

COREY HENNINGS
PROJECT DIRECTOR
TEL: 862-233-3537
EMAIL: CHENNINGS@LEHRERCUMMING.COM

CIVIL ENGINEER

PS&S
3 MOUNTAINVIEW ROAD
WARREN, NJ 07059

PATRICIA A. RUSKAN, PE
VICE PRESIDENT
TEL: 732-584-0479
EMAIL: PRUSKAN@PSANDS.COM

STRUCTURAL ENGINEER

O'DONNELL & NACCARATO
200 CENTRAL AVENUE, #202
MOUNTAINSIDE, NJ 07092

PAUL P. PANZARINO, PE
VICE PRESIDENT
TEL: 908-379-2911
EMAIL: PPANZARINO@O-N.COM

PARKING CONSULTANT

THA CONSULTING, INC.
550 TOWNSHIP LINE ROAD, SUITE 100
BLUE BELL, PA 19422

REGINALD PIGGEE, RA
PROJECT MANAGER
TEL: 732-253-0690 EXT 2
EMAIL: RPIGGEE@THA-CONSULTING.COM

MEP ENGINEER

CONCORD ENGINEERING
520 SOUTH BURNT MILL ROAD
VOORHEES, NJ 08043

JOHN A. MARCHIAFAVA, PE
TEL: 856-427-0200
EMAIL: JMARCHIAFAVA@CONCORD-ENGINEERING.COM

LOCATION MAP

N

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

COVER SHEET

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-000

GENERAL NOTES

1. ALL WORK PERFORMED BY THE CONTRACTOR SHALL BE IN STRICT CONFORMANCE WITH THE PROVISIONS OF THE LATEST EDITION OF THE NEW JERSEY STATE UNIFORM CONSTRUCTION CODE AND INTERNATIONAL BUILDING CODE OF NEW JERSEY AND ALL ITS SUB CODES, OSHA AND ADA REQUIREMENTS AND ANY OTHER LOCAL, REGIONAL OR FEDERAL REGULATIONS.
2. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL VERIFY EXISTING CONDITIONS AND REVIEW THESE CONDITIONS WITH THE PLANS BEFORE, DURING AND AFTER CONSTRUCTION, AND ANY DISCREPANCIES BETWEEN THE ACTUAL CONDITIONS AND THE PLANS AND SPECIFICATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT IN WRITING IMMEDIATELY.
3. ALL WALL THICKNESS ARE NOMINAL DIMENSIONS ONLY ROUNDED TO THE NEAREST WHOLE INCH, REFER TO WALL SECTIONS AND DETAILS FOR THEIR ACTUAL THICKNESS.
4. ALL DIMENSIONS ARE FROM THE FACE OF MASONRY, FACE OF GYPSUM BOARD BOARD OR FROM THE COLUMN CENTER LINES UNLESS OTHERWISE NOTED.
5. EXCEPT WHERE OTHERWISE INDICATED, ALL WALLS AND PARTITION ARE DIMENSIONED TO THEIR "NOMINAL" SIZES. WHERE DIMENSIONS ARE NOTED AS "MIN.", PROVIDE MIN. CLEAR TO FINISH SURFACES.
6. BEFORE COMMENCING WORK, THE CONTRACTOR SHALL PROPERLY IDENTIFY AND MARK-UP ALL EXISTING UTILITIES.
7. DO NOT SCALE DRAWINGS.
8. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED BUT NECESSARY FOR PROPER EXECUTION OF ANY PART OF THE WORK SHALL BE INCLUDED AS IF THEY WERE INDICATED IN THE DRAWINGS.
9. REFER TO STRUCTURAL, MECHANICAL, ELECTRICAL AND PLUMBING DRAWINGS FOR ADDITIONAL GENERAL NOTES, ABBREVIATIONS, SYMBOLS AND LEGENDS. ALL NOTES ARE TO BE REVIEWED AND APPLIED TO RELATED BUILDING COMPONENTS.
10. WHERE PIPING IS TO BE CONCEALED, THE HUNG OR FURRED CEILING IN THIS AREAS ARE NOT TO BE INSTALLED UNTIL THOSE PIPES HAVE BEEN PROPERLY TESTED.
11. INTERIOR PARTITIONS SHALL NOT BE BUILT TO FULL HEIGHT UNLESS ALL DUCTS, PIPES, ETC. ARE IN PLACE.
12. ALL SPACES WITH FLOOR DRAIN (INCLUDING AREAWAYS) SHALL HAVE THEIR FLOORS PITCHED TO THOSE FLOOR DRAINS UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
13. ALL ITEMS RECESSED INTO RATED PARTITIONS (SUCH AS OUTLET BOXES, PANEL BOXES, ETC) SHALL HAVE THOSE OPENINGS PROTECTED WITH BACK-UP MATERIALS SO AS TO RETAIN THE INTEGRITY OF THE PARTITION RATING THROUGHOUT.
14. ALL STRUCTURAL STEEL LESS THAN 8" FROM EXTERIOR SHALL BE PROPERLY WATERPROOFED.
15. EXCEPT AS OTHERWISE INDICATED, DOOR SADDLES OR DIVIDING STRIPS ARE REQUIRED AT INTERIOR DOOR OPENINGS WHERE DIFFERENT TYPES OF FLOOR FINISHES OCCUR IN IMMEDIATELY ADJOINING ROOMS. POSITION ON LINE OF CENTER DOOR WHEN DOOR IS CLOSED.
16. THE GENERAL CONTRACTOR SHALL FURNISH AND INSTALL ALL LINTELS, STRUTS, BRACKETS, HANGERS, ETC. WHEREVER NECESSARY TO SUPPORT OR BRACE ALL FINISHES, EQUIPMENT RECESSES, HEADS OVER OPENINGS, FURNITURE, ETC.
17. THE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UNDERGROUND UTILITIES AND ELECTRICAL CONDUITS PRIOR TO STARTING ANY EXCAVATION OPERATIONS. SHOULD ANY CONDUITS BE ENCOUNTERED WHICH WERE NOT KNOWN TO EXIST, THE CONTRACTOR SHALL STOP WORK IN THAT AREA AND IMMEDIATELY NOTIFY THE ARCHITECT.
18. SWEEPING, BRUSHING, AND OTHER GENERAL CLEANING OF COMPLETED WORK AND THE REMOVAL OF DEBRIS, SURPLUS MATERIALS, TOOLS NOT IN ACTIVE USE, SCAFFOLDING AND OTHER EQUIPMENT NO LONGER NEEDED SHALL BE CARRIED OUT ON AN ONGOING BASIS. IN ADDITION, REMOVE STAINS, SPOTS, MARKS, AND DIRT FROM FINISH WORK. THE JOB IS TO BE MAINTAINED FREE OF RUBBISH. DISPOSE OF ALL RUBBISH IN ACCORDANCE WITH LOCAL ORDINANCES.
19. ALL HEIGHTS INDICATED ON REFLECTED CEILING PLANS ARE FROM TOP OF FINISHED FLOOR TO BOTTOM OF CEILING / FIXTURE SPECIFIED, U.O.N..
20. THE CONTRACTOR SHALL FURNISH & INSTALL ALL CLIPS, ANGLES AND MISC. STEEL TO SECURE FRAMING TO STRUCTURE
21. HINGE SIDE OF DOOR TO BE 4" FROM ADJACENT WALL OR AS OTHERWISE MENTIONED.
22. MASONRY OPENING ARE NOMINAL DIMENSIONS, CONTRACTOR TO ALLOW CLEARANCE AT OPENING TO INSTALL WINDOW SYSTEM, DOOR SYSTEM OR OTHER ITEMS INSTALLED IN MASONRY.
23. ALL METAL FLASHING SHALL BE STAINLESS STEEL, UNLESS NOTED OTHERWISE.
24. AT LOCATION WHERE SHELF ANGLES ARE INSTALLED, INSTALL STAINLESS STEEL FLASHING, WEEPHOLES AND MORTAR NET.
25. ALL EXPOSED INTERIOR/EXTERIOR METAL ITEMS TO BE PRIMED AND PAINTED (INCLUDING GALVANIZED METALS) UNLESS OTHERWISE NOTED.
26. ALL STEEL LINTELS TO BE GALVANIZED AND PAINTED INCLUDING ALL EXTRA STEELS SPECIFIED HEREIN.
27. ALL EXPOSED GWB TO BE SPACKLED PRIMED AND PAINTED UNLESS OTHERWISE NOTED

ABBREVIATIONS

ALUM.	ALUMINUM	M.O.H.	MIRROR OPPOSITE HAND
A.F.F.	ABOVE FINISH FLOOR	MTD.	MOUNTED
ALT.	ALTERNATE	MTL	METAL
APPROX.	APPROXIMATE	MFD.	METAL FLOOR DECK
ARCH.	ARCHITECT	MDF.	MEDIUM DENSITY FIBERBOARD
ARCH'L.	ARCHITECTURAL	MRD.	METAL ROOF DECK
BD.	BOARD	MULL.	MULLION
BLDG.	BUILDING		
B.O.	BOTTOM OF	N	NORTH
		NAT.	NATURAL
C.J.	CONTROL JOINT	N.I.C.	NOT IN CONTRACT
CLG.	CEILING	NO.	NUMBER
CU	CONDENSING UNIT	N.T.S.	NOT TO SCALE
CLO.	CLOSET		
C.T.	CERAMIC TILE	O.A.	OVERALL
COL.	COLUMN	O.A.I.	OUTSIDE AIR INTAKE
C.M.U.	CONCRETE MASONRY UNIT	O.C.	ON CENTER
CONC.	CONCRETE	OPNG.	OPENING
CONST.	CONSTRUCTION	OPP.	OPPOSITE
CONT.	CONTINUOUS	ORIG.	ORIGINAL
		O.H.	OVERHEAD
DET.	DETAIL	O.D.	OVERFLOW DRAIN
DIA.	DIAMETER		
DIM.	DIMENSION	PART.	PARTITION
DN.	DOWN	PTN.	PARTITION
DR.	DOOR	PASS.	PASSENGER
DWG.	DRAWING	PLAS.	PLASTIC
		PL. LAM.	PLASTIC LAMINATE
EA.	EACH	PL.	PLATE
ELEC.	ELECTRIC	PLYWD.	PLYWOOD
ELECT'L.	ELECTRICAL	PANL.	PANEL
ENCL.	ENCLOSURE	PR.	PAIR
EL.	ELEVATION	PTD.	PAINTED
ELEV.	ELEVATOR	P.V.C.	POLYVINYL CHLORIDE
E.M.R.	ELEVATOR MACHINE ROOM	P.S.I.	POUNDS PER SQUARE INCH
EQUIP.	EQUIPMENT	P.S.F.	POUNDS PER SQUARE FOOT
EQ.	EQUAL		
E.W.C.	ELECTRIC WATER COOLER	R.	RISER
EXIST.	EXISTING	RAD.	RADIUS
E.T.R.	EXISTING TO REMAIN	RB	RUBBER BASE
EXP.	EXPANSION	RCP	REFLECTED CEILING PLAN
EXT.	EXTERIOR	R.D.	ROOF DRAIN
E.J.	EXPANSION JOINT	RE.	REFERENCE
E.O.S.	EDGE OF SLAB	REF.	REFRIGERATOR
		REFL.	REFLECTED
F.D.	FLOOR DRAIN	REQ'D.	REQUIRED
F.E.C.	FIRE EXTINGUISHER CABINET	REINF.	REINFORCING
FDN.	FOUNDATION	REV.	REVISION
FIN.	FINISH	R.H.	RIGHT HAND
FL.	FLOOR	RM.	ROOM
FLR.	FLOOR	R.O.	ROUGH OPENING
FLUOR.	FLUORESCENT	R.O.D.	ROOF OVERFLOW DRAIN
FT.	FOOT / FEET	RTU	ROOFTOP UNIT
FTG.	FOOTING		
		SECT.	SECTION
GA.	GAUGE	SHO.	SHOWER
GALV.	GALVANIZED	SIM.	SIMILAR
GL.	GLASS	SK	SKETCH
GWB	GYPSUM WALL BOARD	SPECS.	SPECIFICATIONS
GYP. BD.	GYPSUM BOARD	SQ.	SQUARE
		S/STL.	STAINLESS STEEL
H/C	HANDICAP	STL.	STEEL
HDWR.	HARDWARE	STD.	STANDARD
HDWD.	HARDWOOD	STRUCT.	STRUCTURE
H.M.	HOLLOW METAL	STRUCT'L	STRUCTURAL
H.P.	HIGH POINT	SUSP.	SUSPENDED
HT.	HEIGHT		
H.V.A.C.	HEATING, VENTILATION, & AIR CONDITIONING	T/	TOP OF
		T.O.	TOP OF
HORIZ.	HORIZONTAL	TEL.	TELEPHONE
HR.	HOUR	TERR.	TERRAZZO
		TRANS.	TRANSFORMER
I.D.	INSIDE DIAMETER	TYP.	TYPICAL
IN.	INCH / INCHES	TBD.	TO BE DETERMINED
INCL.	INCLUDING	U.L.	UNDERWRITER'S LABORATORY
INFO.	INFORMATION	UNFIN.	UNFINISHED
INSUL.	INSULATION	U.O.N.	UNLESS OTHERWISE NOTED
INV.	INVERT	UTIL.	UTILITY
JT.	JOINT	V.B.	VINYL BASE
LAM.	LAMINATE	V.C.T.	VINYL COMPOSITION TILE
LAV.	LAVATORY	VERT.	VERTICAL
LG.	LONG	VEST.	VESTIBULE
L.P.	LOW POINT	V.I.F.	VERIFY IN FIELD
LT.	LIGHT	VOL.	VOLUME
LT. WT.	LIGHT WEIGHT	VTR	VENT THRU ROOF
MACH.	MACHINE	W/	WITH
M.H.	MANHOLE	W.C.	WATER CLOSET
MAT'L	MATERIAL	WDW.	WINDOW
MAX.	MAXIMUM	W.F.	WIDE FLANGE
MECH.	MECHANICAL	W.O.	WINDOW OPENING
MEMB.	MEMBRANE	W.P.	WORKING POINT
MIN.	MINIMUM	W.W.F.	WELDED WIRE FABRIC
MIR.	MIRROR		
MISC.	MISCELLANEOUS		
M.O.	MASONRY OPENING		
MLDG.	MOLDING		

SYMBOLS

- PARTITON TYPE
- WINDOW TYPE
- KEYNOTES
- DEMOLITION KEYNOTES
- REVISION TAG
- DOOR NUMBER
- ELEVATION POINTER / WORK POINT

Drawing Title / Drawing No. / Sheet No. / Drawing Scale

- PLAN — 1 / A.100 — SCALE
- ELEVATION — 1 / A.200 — SCALE
- SECTION — 1 / A.200 — SCALE
- DETAIL — 1 / A.200 — SCALE

BUILDING SECTION — A / A.200

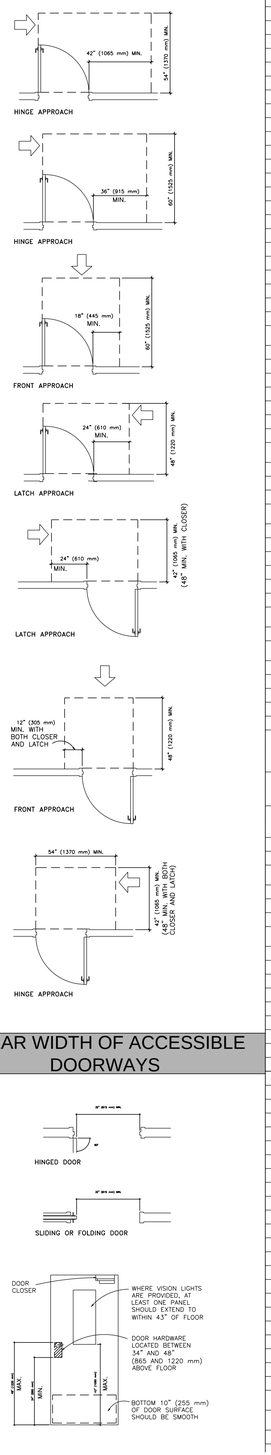
WALL SECTION — A / A.200

PLAN DETAIL OR SECTION DETAIL — 1 / A.300

MATERIALS LEGEND

- CONCRETE
- BRICK OR FACEBLOCK
- LIMESTONE/GRANITE
- CMU
- STEEL
- PLYWOOD
- WOOD STUD / WOOD BLOCKING
- RIGID INSULATION
- SHIM
- CARPET
- GYPSUM BOARD
- EARTH
- GRAVEL / POROUS FILL
- BATT INSULATION

ACCESSIBLE CLEARANCES AT SWINGING DOORS



CLEAR WIDTH OF ACCESSIBLE DOORWAYS

DRAWING INDEX

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.777.2606
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

GENERAL NOTES ABBREVIATIONS, SYMBOLS AND DRAWING INDEX

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-001

BUILDING CODE INFORMATION

PROJECT NAME:	UNION COUNTY PARKING DECK
LOCATION:	ELIZABETHTOWN PLAZA & CALDWELL PLACE, ELIZABETH NJ, 07202
LOT & BLOCK NO.:	BLOCK 6, LOT 1366
ZONE:	C5 ZONE - COMMERCIAL
PROPOSED	MIXED USED BUILDING - LOW-HAZARD STORAGE, GROUP S-2: OPEN PARKING GARAGE - BUSINESS GROUP B: SHERIFF'S DEPARTMENT
HEIGHT	8 TIERS
NUMBER OF SPACES	359
CONSTRUCTION TYPE:	1B

APPLICABLE CODES

THE PRIMARY CODE REFERENCE WILL BE THE NEW JERSEY UNIFORM CONSTRUCTION CODE (N.J.A.C. 5:23 ET SEQ). THE UNIFORM CONSTRUCTION CODE ADOPTS SEVERAL MODEL CODES THAT ARE REFERENCED AS SUBCODES. THESE SUBCODES ARE AN INTEGRAL PART OF THE UNIFORM CONSTRUCTION CODE AND ARE AS FOLLOWS:

SUBCODE	NATIONAL MODEL CODE	UCC REFERENCE
BUILDING	I.B.C. 2018 NEW JERSEY EDITION	N.J.A.C. 5:23-3.14
BARRIER FREE SUBCODE	ANSI-A117.1-2009	N.J.A.C. 5.23-7
PLUMBING	NATIONAL STANDARD PLUMBING CODE 2018	N.J.A.C. 5:23-3.15
ELECTRICAL	NATIONAL ELECTRICAL CODE 2017	N.J.A.C 5:23-3.16
ENERGY	INTERNATIONAL ENERGY CONSERVATION CODE 2018	N.J.A.C. 5:23-3.18
MECHANICAL	INTERNATIONAL MECHANICAL CODE 2018	N.J.A.C. 5.23-3.20
FUEL GAS SUBCODE	INTERNATIONAL FUEL GAS CODE 2018	N.J.A.C. 5.23-3.22

	CODE REQUIREMENTS	INTERNATIONAL BUILDING CODE/2018 NJ EDITION, U.N.O.			COMMENTS
		REFERENCE	ALLOWABLE OR REQUIRED	PROVIDED	
GENERAL BUILDING, HEIGHT AND AREA	BUILDING USE GROUPS	311.3	LOW-HAZARD STORAGE GROUP S-2	–	–
		304.1	BUSINESS GROUP B	–	–
	HIGH-RISE BUILDINGS	403.1		NOT APPLICABLE	PER EXCEPTION 2 SECTION 403.1 OPEN PARKING GARAGES ARE EXEMPT FROM HIGH-RISE BUILDING CLASSIFICATION
	PUBLIC PARKING GARAGES	406.4			OPEN PARKING GARAGE CLASSIFICATION, SEE 406.5
	CLEAR HEIGHT	406.2.2	THE CLEAR HEIGHT OF EACH FLOOR LEVEL IN VEHICLE AND PEDESTRIAN TRAFFIC AREAS SHALL BE NOT LESS THAN 7 FEET (2134 MM). CANOPIES UNDER WHICH FUELS ARE DISPENSED SHALL HAVE A CLEAR HEIGHT IN ACCORDANCE WITH SECTION 406.7.2.	DESIGN COMPLIES AS REQUIRED	–
		ICC/ANSI A117.1 502.6	VAN ACCESSIBLE: 8'-2" MIN.	DESIGN COMPLIES AS REQUIRED	ALL VAN ACCESSIBLE SPACES LOCATED AT THIRD TIER
	FLOOR SURFACES	406.2.4	FLOOR SURFACES SHALL BE OF CONCRETE OR SIMILAR APPROVED NONCOMBUSTIBLE AND NONABSORBENT MATERIALS. THE AREA OF FLOOR USED FOR THE PARKING OF AUTOMOBILES OR OTHER VEHICLES SHALL BE SLOPED TO FACILITATE THE MOVEMENT OF LIQUIDS TO A DRAIN OR TOWARD THE MAIN VEHICLE ENTRY DOORWAY. THE SURFACE OF VEHICLE FUELING PADS IN MOTOR FUEL-DISPENSING FACILITIES SHALL BE IN ACCORDANCE WITH SECTION 406.7.1.	DESIGN COMPLIES AS REQUIRED	–
	GUARDS	406.4.1	PEDESTRIAN GUARDS REQUIRED	42"H PRECAST SPANDRELS @ GARAGE PERIMETER. STEEL 42" PEDESTRIAN GUARDS @ STAIRS.	PER SECTION 1013 (LOCATED WHERE VERTICAL DISTANCE BETWEEN WALKING SURFACE AND LOWER ADJACENT SURFACE EXCEEDS 30 INCHES)
	VEHICULAR BARRIER SYSTEM	406.4.2	2'-9" MIN. VEHICLE GUARDS REQ'D	NO VARIATIONS GREATER THAN 1'-0" EXIST ON FIRST TIER. 3'-6" SOLID BARRIERS PROVIDED AT SUPPORTED TIERS.	WHERE DIFFERENCE IN FLOOR ELEVATION EXCEEDS 1 FOOT. BARRIER COMPLYING WITH LOADING SECTION 1607.7.3
	RAMPS	406.4.3	1:15 (6.67%) MAX. SLOPE FOR PARKING	VARIES, DESIGN COMPLIES AS REQUIRED	SEE PLANS A0.5.
	OPEN PARKING GARAGES	406.5			
	CONSTRUCTION	406.5.1	MUST BE OF TYPE I, II, OR IV	TYPE IB CONSTRUCTION	–
	OPENINGS	406.5.2	20% MIN. FACADE SQUARE FOOT OPENNESS DISTRIBUTED OVER 40% MIN. FEET OF GARAGE PERIMETER AT EACH TIER. 20% MIN. OPENNESS UNIFORMLY DISTRIBUTED AT INTERIOR WALLS.	DESIGN COMPLIES AS REQUIRED	SEE OPENNESS DIAGRAMS ON G0.6, G0.7, G0.8, G0.9.
	MIXED OCCUPANCIES AND USES	406.5.3	MIXED USES SHALL BE ALLOWED IN THE SAME BUILDING AS AN OPEN PARKING GARAGE SUBJECT TO PROVISIONS OF SECTIONS 402.4.2.3, 406.5.11, 508.1, 510.3, 510.4 AND 510.7.	EACH PORTION OF THE BUILDING TO BE CLASSIFIED INDIVIDUALLY PER 508.1.	402.4.2.3, 406.5.11, 510.5, 510.4, 510.7 DO NOT APPLY.
	AREA AND HEIGHT	406.5.4	SEE CHAPTER 5	–	406.5.4.1 SINGLE USE SHALL APPLY AS THE BUILDING DESIGN IS USED EXCLUSIVELY FOR THE PARKING OR STORAGE OF PRIVATE MOTOR VEHICLES.
	BUILDING HEIGHT AND NUMBER OF STORIES	TABLE 504.3 TABLE 504.4 TYPE IB CONST. SPRINKLERED	OCC. CLASS HEIGHT STORIES S-2 160 FT 8	OCC. CLASS HEIGHT STORIES S-2 89 FT 8	–
	BUILDING AREA	TABLE 506.2 BUILDING AREA	S-2 LOW HAZARD STORAGE = 237,000 SF	DESIGN COMPLIES AS REQUIRED REFER TO PLAN	–
	ALLOWABLE AREA DETERMINATION, MIXED-OCCUPANCY, MULTISTORY BUILDINGS	506.2.4 (AS DESIGNED)			
		FIRST TIER	IN EACH STORY, THE SUM OF RATIOS OF THE ACTUAL BUILDING AREA DIVIDED ALLOWABLE BUILDING AREA OF EACH SEPARATED OCCUPANCY GROUP SHALL NOT EXCEED 1 PER SECTION 508.4. THE AGGREGATE SUM OF THE RATIOS OF THE ACTUAL AREA OF EACH STORY DIVIDED BY THE ALLOWABLE AREA OF SUCH STORIES SHALL NOT EXCEED 3.	B = 2,057 S.F. S-2 = 17,103 S.F. TOTAL = 19,160 S.F. 2,057/UNLIMITED = 0.00 17,103/237,000 = .07 FIRST TIER RATIO = .07	DESIGN COMPLIES AS REQUIRED WITH SECTION 508.4.2.
		SECOND TIER		GROUP S-2 19,160/237,000 = .08	
		THIRD TIER		GROUP S-2 20,456/237,000 = .09	
		FOURTH TIER		GROUP S-2 20,456/237,000 = .09	
		FIFTH TIER		GROUP S-2 20,456/237,000 = .09	
		SIXTH TIER		GROUP S-2 20,456/237,000 = .09	
		SEVENTH TIER		GROUP S-2 20,456/237,000 = .09	
		EIGHTH TIER		GROUP S-2 2,946 /237,000 = .01	
		AGGREGATE SUM = .61 < 3			
	MIXED USE AND OCCUPANCY	508.1	EACH PORTION OF A BUILDING SHALL BE INDIVIDUALLY CLASSIFIED IN ACCORDANCE WITH SECTION 302.1	BUILDING AREAS ARE INDIVIDUALLY CLASSIFIED	BUILDING DESIGNED AS A NON SEPARATED OCCUPANCY. OCCUPANCY GROUP S-2 MOST RESTRICTIVE USE PER 508.3
TYPES OF CONSTRUCTION	MIXED USE AND OCCUPANCY	508.2.3	ACCESSORY OCCUPANCIES SHALL NOT OCCUPY MORE THAN 10% OF THE BUILDING AREA OF THE STORY IN WHICH THEY ARE LOCATED AND SHALL NOT EXCEED THE TABULAR VALUES OF TABLE 503. OCCUPANCIES SHALL BE INDIVIDUALLY CLASSIFIED PER SECTION 302.1. ALLOWABLE HEIGHT AND AREA SHALL BE BASED ON SECTION 503. NO SEPARATION IS REQUIRED BETWEEN ACCESSORY OCCUPANCIES AND THE MAIN OCCUPANCY.	ACCESSORY OCCUPANCIES INCLUDING ELEVATOR MACHINE ROOMS, ELECTRICAL ROOM, WATER SERVICE ROOM, UTILITY ROOM, ETC...DO NOT OCCUPY MORE THAN 10% OF THE FIRST FLOOR BUILDING AREA.	–
		508.4.2	IN EACH STORY, THE BUILDING AREA SHALL BE SUCH THAT THE SUM OF THE RATIOS OF THE ACTUAL BUILDING AREA OF EACH SEPARATED OCCUPANCY DIVIDED BY THE ALLOWABLE BUILDING AREA OF EACH SEPARATED OCCUPANCY SHALL NOT EXCEED 1.	ALL PER FLOOR ALLOWABLE AREA RATIOS DO NOT EXCEED 1.	SEE 506.2.4 AREA DETERMINATION CALCULATIONS.
		508.4.4 TABLE 508.4	INDIVIDUAL OCCUPANCIES SHALL BE SEPARATED FROM ADJACENT OCCUPANCIES PER TABLE 508.3	SEPARATIONS PROVIDED (HRS): NOT APPLICABLE	–
	CONSTRUCTION CLASSIFICATION	602	IB, NON-COMBUSTIBLE	DESIGN COMPLIES AS REQUIRED	PRECAST CONCRETE STRUCTURE.
	FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS	TABLE 601	IB		SEE G0.5 FOR FIRE SEPARATION DISTANCES.
	PRIMARY STRUCTURAL FRAME		2 HOURS	DESIGN COMPLIES AS REQUIRED	PRECAST CONCRETE COLUMNS, BEAMS AND GIRDERS.
	BEARING WALLS EXT.		2 HOURS	DESIGN COMPLIES AS REQUIRED	PRECAST CONCRETE WALL PANELS AND SHEAR WALLS.
	BEARING WALLS INT.		2 HOURS	DESIGN COMPLIES AS REQUIRED	PRECAST CONCRETE LIGHT WALLS (RAMP).
	NONBEARING WALLS EXTERIOR		0 HOUR	DESIGN COMPLIES AS REQUIRED	PRECAST CONCRETE WALL PANELS AND BEAMS. SUBNOTE c. OPEN PARKING GARAGES COMPLYING WITH SECTION 406 SHALL NOT BE REQUIRED TO HAVE A FIRE-RESISTANCE RATING.
			0 HOUR	DESIGN COMPLIES AS REQUIRED	–
	NONBEARING WALLS INTERIOR		0 HOUR	DESIGN COMPLIES AS REQUIRED	SUBNOTE d. NOT LESS THAN FIRE-RESISTANCE RATING REQUIRED BY OTHER SECTIONS OF THIS CODE.
	FLOOR & SECONDARY MEMBERS		2 HOURS	DESIGN COMPLIES AS REQUIRED	PRECAST DOUBLE TEES.
	ROOF & SECONDARY MEMBERS		1 HOURS	DESIGN COMPLIES AS REQUIRED	PRECAST DOUBLE TEES AND CONCRETE SLAB.
FIRE AND SMOKE PROTECTION	FIRE-RESISTANCE RATING	703.2	–	–	SHALL BE DETERMINED IN ACCORDANCE WITH THE TEST PROCEDURES SET FORTH IN ASTM E 119 OR UL 263 OR IN ACCORDANCE WITH SECTION 703.3.
	EXTERIOR WALLS	705			
	TYPE I CONSTRUCTION	705.2.1	PROJECTIONS FROM WALLS OF TYPE I CONSTRUCTION SHALL BE OF NONCOMBUSTIBLE MATERIALS.	DESIGN COMPLIES AS REQUIRED	–
	FIRE-RESISTANCE RATINGS, EXTERIOR WALLS	705.5	F.S.D. > 5' = RATED FROM INSIDE F.S.D. < 5' = RATED FROM BOTH SIDES	DESIGN COMPLIES AS REQUIRED 2 HOUR RATING – FOR LESS THAN 5' 1 HOUR RATING – GREATER THAN 5'	F.S.D. AROUND ENTIRE PERIMETER OF GARAGE EXCEEDS 5'-0" EXCEPT AT SOUTH ELEVATION WHICH IS 2'-8" FROM FACE OF ADJACENT BUILDING.
	MAX. AREA OF EXT. WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION	TABLE 705.8 PROTECTED SPRINKLERED	0 TO LESS THAN 3': NOT PERMITTED 3' TO LESS THAN 5': 15% 5' TO LESS THAN 10': 25% 10' TO LESS THAN 15': 15% (g.) 15' TO LESS THAN 20': 25% (g.) 20' TO LESS THAN 25': 45% (g.) 25' TO LESS THAN 30': 70% (g.) 30' OR GREATER: NO LIMIT	F.S.D. 30' OR GREATER PROVIDED AT NORTH, EAST, AND WEST ELEVATIONS = NO LIMIT ON UNPROTECTED OPENINGS. LESS THAN 3' PROVIDED ON SOUTH ELEVATION.	F.S.D. 30' OR GREATER PROVIDED AT NORTH, EAST, AND WEST ELEVATIONS = NO LIMIT 0' TO LESS THAN 3' PROVIDED ON SOUTH ELEVATION – NO OPENINGS ARE PROVIDED. SUBNOTE g. OPEN PARKING STRUCTURES WITH A F.S.D. OF 10 FEET OR GREATER SHALL NOT BE LIMITED.
	VERT. SEPARATION OF OPENINGS	705.8.5	MIN. 3'-0" VERTICAL SEPARATION.	DESIGN COMPLIES AS REQUIRED	3'-9" MIN. VERTICAL SEPARATION PROVIDED BETWEEN PARKING GARAGE TIERS.
	JOINTS	705.9	JOINTS REQUIRED TO BE FIRE-RESISTANCE RATED SHALL COMPLY WITH SECTION 714	DESIGN COMPLIES AS REQUIRED	–
	PARAPETS	705.11	30 INCHES MINIMUM ABOVE THE INTERSECTION OF THE ROOF AND PARAPET	PER EXCEPTION #3, A 12" HIGH PARAPET IS PROVIDED.	EXCEPTION: 3. WALLS THAT TERMINATE AT ROOFS OF NOT LESS THAN 2-HOUR FIRE-RESISTANCE-RATED CONSTRUCTION OR WHERE THE ROOF, INCLUDING THE DECK OR SLAB AND SUPPORTING CONSTRUCTION, IS CONSTRUCTED ENTIRELY OF NONCOMBUSTIBLE MATERIALS.
	FIRE-RESISTANT RATINGS	707.3	707.3.1 SHAFT ENCLOSURES SEE 713.4 707.3.2 INT. EXIT STAIRWAYS SEE 1023.1 707.3.9 SEPARATED OCC'S TABLE 508.4	DESIGN COMPLIES AS REQUIRED	–
	VERTICAL OPENINGS – PARKING GARAGES	712.1.10.1-3	VERTICAL OPENINGS FOR AUTOMOBILE RAMPS IN OPEN PARKING GARAGES SHALL BE PERMITTED. VERTICAL OPENINGS FOR ELEVATOR HOISTWAYS IN OPEN PARKING GARAGES THAT SERVE ONLY THE PARKING GARAGE SHALL BE PERMITTED. VERTICAL OPENINGS FOR MECHANICAL EXHAUST OR SUPPLY DUCT SYSTEMS IN OPEN PARKING GARAGES SHALL BE PERMITTED TO BE UNENCLOSED WHERE DUCTS SYSTEM IS CONTAINED WITHIN AND ONLY SERVE THE PARKING GARAGE.	OPEN PARKING GARAGE RAMP IS UNENCLOSED. ELEVATOR HOISTWAY IS ENCLOSED WITH FIRE-RESISTANCE RATING	–
	SHAFT ENCLOSURES	713	OPENINGS THROUGH A FLOOR/CEILING ASSEMBLY SHALL BE PROTECTED BY A SHAFT ENCLOSURE COMPLYING WITH THIS SECTION.	DESIGN COMPLIES AS REQUIRED	
	FIRE-RESISTANCE RATING	713.4	SHAFT ENCLOSURES SHALL HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 2 HOURS WHERE CONNECTING FOUR STORIES OR MORE, 1 HOUR WHEN CONNECTING LESS THAN 4 STORIES.	DESIGN COMPLIES AS REQUIRED	MECHANICAL SHAFT FOR THE ROOFTOP GENERATOR SHALL BE 2 HOUR RATED
		713.6	WHERE EXT. WALLS SERVE AS A PART OF A REQUIRED SHAFT ENCLOSURE, SUCH WALLS SHALL COMPLY WITH THE REQUIREMENTS OF SECTION 705 FOR EXTERIOR WALLS AND THE FIRE-RESISTANCE-RATED ENCLOSURE REQUIREMENTS SHALL NOT APPLY.	DESIGN COMPLIES AS REQUIRED	
	PENETRATIONS	714	REQUIRED	DESIGN COMPLIES AS REQUIRED	PENETRATIONS THROUGH FIRE-RESISTANT CONSTRUCTION SHALL COMPLY WITH THIS SECTION.
	FIRE-RESISTANCE JOINT SYSTEMS	715	REQUIRED	DESIGN COMPLIES AS REQUIRED	JOINTS IN OR BETWEEN FIRE-RESISTANT RATED ASSEMBLIES SHALL COMPLY WITH THIS SECTION. EXCEPTION 5. FLOORS AND RAMPS WITHIN PARKING GARAGES CONSTRUCTED IN ACCORDANCE WITH SECTIONS 406.5 AND 406.6
	THERMAL AND SOUND INSULATING MATERIALS	720.2	CONCEALED INSTALLATION FLAME SPREAD INDEX NOT MORE THAN 25 AND SMOKE-DEVELOPED INDEX OF NOT MORE THAN 450	DESIGN COMPLIES AS REQUIRED	–
INTERIOR FINISHES	INTERIOR WALL & CEILING FINISH REQUIREMENTS BY OCCUPANCY	TABLE 803.13	GROUP B, SPRINKLERED EXIT ENCLOSURES & PASSAGEWAYS: B CORRIDORS: C ROOMS & ENCLOSED SPACES: C	DESIGN COMPLIES AS REQUIRED	

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.0066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CODE ANALYSIS SUMMARY

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-002

CODE REQUIREMENTS	INTERNATIONAL BUILDING CODE/2018 NJ EDITION, U.N.O.			COMMENTS
	REFERENCE	ALLOWABLE OR REQUIRED	PROVIDED	
FIRE PROTECTION SYSTEMS				
AUTOMATIC SPRINKLER SYSTEMS	903.2	APPROVED AUTO. SPRINKLER SYSTEMS IN NEW BUILDINGS AND STRUCTURES SHALL BE PROVIDED IN LOCATIONS DESCRIBED IN SECTIONS 903.2.1 THROUGH 903.2.12	GROUP S-2 REQUIRED	GROUP S-2 REQUIRES AN AUTOMATIC SPRINKLER SYSTEM PER TABLE 504.4
STANDPIPE SYSTEMS	S-2 GARAGE 905.3.1 905.3.2	CLASS III SYSTEMS SHALL BE INSTALLED THROUGHOUT BLDGS WHERE THE FLR LVL OF THE HIGHEST STORY IS LOCATED MORE THAN 30 FEET ABOVE THE LOWEST LEVEL OF FIRE DEPT. VEHICLE ACCESS. CLASS I REQUIRED IN BLDGS EXCEEDING 10,000 SF AND 200' DEPT ACCESS.	CLASS I MANUAL DRY SYSTEM PROVIDED WITH LOCATIONS AS REQUIRED PER CLASS II IN PARKING GARAGE.	905.3.1 EXCEPTIONS: 3. CLASS I MANUAL DRY STANDPIPES ARE ALLOWED IN OPEN PARKING GARAGES THAT ARE SUBJECT TO FREEZING TEMPERATURES WITH HOSE CONNECTIONS LOCATED AS REQUIRED PER CLASS II. LOCATIONS SHOWN ON A0.5 CODE PLAN DIAGRAMS AND FIRE PROTECTION DRAWINGS. 905.3.1 EXCEPTION 2. GROUP S-2 OCCUPANCY.
	905.4.3	CLASS I STANDPIPES SHALL HAVE 2 1/2 INCH HOSE CONNECTION WITH VALVES AND THREADS COMPATIBLE WITH THE CONNECTIONS USED BY THE LOCAL FIRE DEPARTMENT. NO MORE THAN 5 FEET A.F.F.	DESIGN COMPLIES AS REQUIRED	LOCATIONS SHOWN ON CODE PLAN DIAGRAMS AND FIRE PROTECTION DRAWINGS.
	905.5	ALL PORTIONS OF A BUILDING WITHIN 30 FEET OF A NOZZLE ATTACHED TO 100 FEET OF HOSE	DESIGN COMPLIES AS REQUIRED	LOCATIONS SHOWN ON CODE PLAN DIAGRAMS AND FIRE PROTECTION DRAWINGS. CONNECTIONS AT EACH FLOOR LEVEL, NOT MORE THAN 5'-0" ABOVE THE FLOOR.
PORTABLE FIRE EXTINGUISHERS	906.3.1	CLASS A FIRE HAZARDS. MINIMUM EXTINGUISHER SIZE AND DISTRIBUTION PER TABLE 906.3(1)	DESIGN COMPLIES AS REQUIRED	SEE TABLE 906.3.1 AND 906.3.2 CALCULATIONS.
	906.3.2	CLASS B FIRE HAZARDS. MINIMUM EXTINGUISHER SIZE AND DISTRIBUTION PER TABLE 906.3(2)	DESIGN COMPLIES AS REQUIRED	SEE TABLE 906.3.1 AND 906.3.2 CALCULATIONS.
	906.3.3	CLASS C FIRE HAZARDS. MINIMUM EXTINGUISHER SIZE AND DISTRIBUTION BASED ON THE BASIS OF THE ANTICIPATED CLASS A OR B HAZARD.	DESIGN COMPLIES AS REQUIRED	SEE TABLE 906.3.1 AND 906.3.2 CALCULATIONS.
	906.8	EXTINGUISHER CABINETS SHALL NOT BE LOCKED.	LOCKING CABINET W/BREAKABLE CAM TO BE INSTALLED	EXCEPTION 1. WHERE SUBJECT TO MALICIOUS USE OR DAMAGE WITH MEANS OF READY ACCESS.
	906.9.1	EXTINGUISHER < 40 LBS MOUNT WITH TOP NOT MORE THAN 5 FEET ABOVE FLOOR	DESIGN COMPLIES AS REQUIRED	–
	TABLE 906.3(1) CLASS A FIRE ORDINARY (MODERATE) HAZARD	MIN. RATED SINGLE EXTINGUISHER 2-A 1,500 SF PER UNIT A, 11,250 MAX. SF PER UNIT. MAXIMUM DISTANCE OF TRAVEL TO EXTINGUISHER 75 FEET.	DESIGN COMPLIES AS REQUIRED	4-A:60-B:C EXTINGUISHERS PROVIDED. 4(A) X 1,500 SF = 6,000 SF PER EXTINGUISHER. 45,261 SF/TIER / 6,000 SF = (8) EXTINGUISHERS MIN. PER TIER. SEE CODE PLAN DIAGRAMS FOR LOCATIONS.
	TABLE 906.3(2) CLASS B FIRE ORDINARY (MODERATE) HAZARD	MAX. TRAVEL DISTANCE TO EXTINGUISHERS IN FEET: 50	DESIGN COMPLIES AS REQUIRED	SEE CODE PLAN DIAGRAMS FOR LOCATIONS.
MEANS OF EGRESS				
GENERAL MEANS OF EGRESS	1003	COMPLY WITH GENERAL REQUIREMENTS OF THIS SECTION	–	REFER TO CHAPTER 4 FOR MEANS OF EGRESS REQUIREMENTS SPECIFIC TO PARKING GARAGE OCCUPANCIES. GENERAL EGRESS REQUIREMENTS ADDRESSED FOR FINISHED SPACE. DETAILED ANALYSIS UNDER SEPARATE COVER.
OCCUPANT LOAD CALCULATION (FUTURE EXPANSION INCLUDED IN CALCULATIONS FOR EGRESS WIDTH COMPONENT SIZING)	TABLE 1004.5			
	FIRST TIER	(1) PARKING GARAGE 200 GROSS (2) SHERIFF'S DEPARTMENT 100 GROSS (3) IT ROOM 300 GROSS (4) IT CLEAN AGENT ROOM 300 GROSS (5) TRAFFIC CONTROL STORAGE 300 GROSS (6) SHERIFF'S DEPT. STORAGE 300 GROSS (7) MAIN ELECTRICAL ROOM 300 GROSS (8) FIRE PUMP ROOM 300 GROSS (9) EMERGENCY ELECT. ROOM 300 GROSS (10) STORAGE ROOM (11) VESTIBULE 200 GROSS (12) LOBBY 200 GROSS (13) ELEV. CNTRL. RM. (ECR) 300 GROSS	(1) 15,784 GSF/200= 82 OCC. (2) 979 GSF/100 = 10 OCC. (3) 125 GSF/300 = 1 OCC. (4) 40 GSF/300 = 1 OCC. (5) 453 GSF/300 = 2 OCC. (6) 277 NSF/300 = 1 OCC. (7) 208 GSF /300 = 1 OCC (8) 226 GSF/300 = 1 OCC. (9) 252 GSF/300 = 1 OCC. (10) 1,628 GSF/300= 5 OCC. (11) 190 GSF/200 = 1 OCC. (12) 212 GSF/200 = 1 OCC. (13) 81 GSF/300 = 1 OCC.	–
	SECOND TIER	(1) PARKING GARAGE 200 GROSS (2) ELEV. CNTRL. RM. (ECR) 300 GROSS (3) ELEV. CNTRL. RM. (ECR) 300 GROSS (4) WATER VALVE ROOM 300 GROSS	(1) 19,026 GSF/200 = 95 OCC (2) 81 GSF/200 = 1 OCC (3) 37 GSF/200 = 1 OCC (4) 16 GSF/200 = 1 OCC	
	THIRD TIER FOURTH TIER FIFTH TIER SIXTH TIER SEVENTH TIER	(1) PARKING GARAGE 200 GROSS (2) WATER VALVE ROOM 300 GROSS (3) ELECTRICAL CLOSET 300 GROSS (4) ELEVATOR LOBBY 200 GROSS	(1) 20,278 GSF/200 = 101 OCC. (2) 16 GSF/200 = 1 OCC. (3) 116 GSF/300 = 1 OCC.	
	EIGHTH TIER	(1) PARKING GARAGE 200 GROSS (2) ELEVATOR LOBBY 200 GROSS	(1) 2,836 GSF/200 = 14 OCC. (2) 116 GSF/300 = 1 OCC.	
MIN. REQUIRED EGRESS WIDTH (NO FUTURE EXPANSION)	1005.3.1 1005.3.2	0.3 INCHES/OCCUPANT FOR STAIRWAYS	0.2 INCHES/OCCUPANT FOR OTHER	
	FIRST TIER	NOT APPLICABLE	S-2 = 93 OCC. X .2 = 19" ACTUAL = 36" B = 15 OCC. X .2 = 3" ACTUAL = 36"	1005.5 MEANS OF EGRESS SIZED SUCH THAT THE LOSS OF ANY MEANS OF EGRESS SHALL NOT REDUCE THE AVAILABLE CAPACITY TO LESS THAN 50 PERCENT OF THE REQUIRED CAPACITY. 1005.7.1 DOORS, WHEN FULLY OPEN SHALL NOT REDUCE THE REQUIRED MEANS OF EGRESS BY MORE THAN 7 INCHES. DOORS IN ANY POSITION SHALL NOT REDUCE THE REQUIRED WIDTH BY MORE THAN HALF.
	SECOND TIER	98 OCC. x 0.3" = 29.4" STAIR WIDTH 98 OCC. x 0.2" = 19.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	THIRD TIER	103 OCC. x 0.3" = 30.9" STAIR WIDTH 103 OCC. x 0.2" = 20.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	FOURTH TIER	103 OCC. x 0.3" = 30.9" STAIR WIDTH 103 OCC. x 0.2" = 20.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	FIFTH TIER	103 OCC. x 0.3" = 30.9" STAIR WIDTH 103 OCC. x 0.2" = 20.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	SIXTH TIER	103 OCC. x 0.3" = 30.9" STAIR WIDTH 103 OCC. x 0.2" = 20.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	SEVENTH TIER	103 OCC. x 0.3" = 30.9" STAIR WIDTH 103 OCC. x 0.2" = 20.6" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
	EIGHTH TIER	15 OCC. x 0.3" = 4.5" STAIR WIDTH 15 OCC. x 0.2" = 3" OTHER WIDTH	44" @ STAIRS A & B = 88" 36" @ STAIRS A & B = 60"	
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY	TABLE 1006.2.1	MAX. OCC. LOAD OF SPACE WITH ONE EXIT B = 49 OCC. @ 100 FT MAX. EXIT ACCESS TRAVEL DISTANCE W/ SPRINKLER SYSTEM S = 29 OCC. @ 100 FT MAX. EXIT ACCESS TRAVEL DISTANCE W/ SPRINKLER SYSTEM	DESIGN COMPLIES AS REQUIRED. SEE CODE PLAN DIAGRAMS.	SUBNOTE a. IN GROUP B THE COMMON PATH IS INCREASED FROM 75 FT TO 100 FT. WHEN BUILDING IS EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.3.1.2
EGRESS BASE ON OCCUPANT LOAD	1006.3.2	TWO EXITS OR EXIT ACCESS DOORWAYS FOR 1-500 OCCUPANT LOAD	TWO EXITS OR ACCESS PROVIDED PER TIER	GROUP S-2 HAS 2 EXITS
EXIT AND EXIT ACCESS DOORWAY CONFIGURATION	1007.1.1 1007.1.1.1	EQUAL TO NOT LESS THAN ONE-HALF OF THE LENGTH OF THE MAX. OVERALL DIAGONAL DIM. OF THE BUILDING OR AREA BEING SERVED MEASURED IN A STRAIGHT LINE BETWEEN ANY POINT ALONG THE WIDTH OF A DOORWAY OR MEASURED TO THE CLOSEST STAIR RISER.	DESIGN COMPLIES AS REQUIRED.	–

CODE REQUIREMENTS	INTERNATIONAL BUILDING CODE/2018 NJ EDITION, U.N.O.			COMMENTS
	REFERENCE	ALLOWABLE OR REQUIRED	PROVIDED	
MEANS OF EGRESS				
MEANS OF EGRESS ILLUMINATION	ILLUMINATION REQUIRED 1008.2 1008.2.1	THE MEANS OF EGRESS SERVING A ROOM OR SPACE SHALL BE ILLUMINATED AT ALL TIMES THAT THE ROOM OR SPACE IS OCCUPIED. UNDER NORMAL POWER ILLUMINATION LEVELS SHALL NOT BE LESS THAN 1 FOOTCANDLE AT THE WALKING SURFACE.	DESIGN COMPLIES AS REQUIRED	SEE ELECTRICAL DRAWINGS FOR EGRESS FIXTURE INFORMATION AND LOCATIONS. SEE 1006.4 FOR PERFORMANCE OF SYSTEM REQUIREMENTS.
MEANS OF EGRESS ILLUMINATION	EMERGENCY POWER 1008.3.1 1008.3.2 1008.3.3 1008.3.4	WHERE TWO OR MORE MEANS OF EGRESS ARE REQUIRED, AREAS TO BE AUTOMATICALLY ILLUMINATED: ROOMS AND SPACES – AISLES, CORRIDORS, EXIT ACCESS STAIRWAYS AND RAMPS. BUILDINGS – INTERIOR EXIT STAIRWAYS, EXTERIOR LANDINGS ROOMS AND SPACES – ELECTRICAL EQUIPMENT ROOMS, FIRE COMMAND CENTER/PANEL, FIRE PUMP ROOMS, GENERATOR ROOMS, PUBLIC RESTROOMS WITH AN AREA GREATER THAN 300 SF. DURATION SHALL NOT BE LESS THAN 90 MINUTES AND SHALL CONSIST OF STORAGE BATTERIES UNIT EQUIPMENT OF ON-SITE GENERATOR.	DESIGN COMPLIES AS REQUIRED	SEE ELECTRICAL DRAWINGS FOR EGRESS FIXTURE INFORMATION AND LOCATIONS. SEE 1006.4 FOR PERFORMANCE OF SYSTEM REQUIREMENTS.
CONTINUITY AND COMPONENTS	1009.2	EACH REQUIRED ACCESSIBLE MEANS OF EGRESS SHALL BE CONTINUOUS TO A PUBLIC WAY...	DESIGN COMPLIES AS REQUIRED	–
ELEVATOR REQUIRED	1009.2.1	AT LEAST ONE ACCESSIBLE ELEVATOR REQUIRED AS A RESULT OF ACCESSIBLE FLOOR FOUR OR MORE STORIES ABOVE THE LEVEL OF EXIT DISCHARGE.	ACCESSIBLE ELEVATOR PROVIDED. TOP ACCESSIBLE FLOOR (EIGHT FLOOR) IS MORE THAN FOUR STORIES ABOVE LEVEL OF EXIT DISCHARGE (FIRST FLOOR).	NOTE: OWNER PROVIDING EMERGENCY GENERATOR FOR ELEVATOR OPERATION.
STAIRWAY WIDTH	1009.3.2	STAIRWAYS SHALL HAVE A CLEAR WIDTH OF 48 INCHES (1219 MM) MINIMUM BETWEEN HANDRAILS.	DESIGN COMPLIES PER EXCEPTION 1	EXCEPTION 1: THE CLEAR WIDTH OF 48 INCHES (1219 MM) BETWEEN HANDRAILS IS NOT REQUIRED IN BUILDINGS EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM INSTALLED IN ACCORDANCE WITH SECTION 903.3.1.1 OR 903.3.1.2.
AREA OF REFUGE	1009.3.3	STAIRWAYS SHALL EITHER INCORPORATE AN AREA OF REFUGE WITHIN AN ENLARGED FLOOR-LEVEL LANDING OR SHALL BE ACCESSED FROM AN AREA OF REFUGE COMPLYING WITH SECTION 1009.6.	DESIGN COMPLIES PER EXCEPTION 3	EXCEPTION 3: AREAS OF REFUGE ARE NOT REQUIRED AT STAIRWAYS SERVING OPEN PARKING GARAGES.
ELEVATORS	1009.4	TO BE CONSIDERED AN ACCESSIBLE MEANS OF EGRESS AN ELEVATOR SHALL COMPLY WITH EMERGENCY OPERATION AND SIGNALING DEVICE REQUIREMENTS OF SECTION 2.27 OF ASME A117.1. STANDBY POWER SHALL BE PROVIDED. ELEVATOR SHALL BE ACCESSED FROM AN AREA OF REFUGE OR HORIZONTAL EXIT.	DESIGN COMPLIES AS REQUIRED	ACCESSIBLE MEANS OF EGRESS IS REQUIRED PER 1009.2.1. PROVISIONS FOR STANDBY POWER REQUIRED. 1. AREAS OF REFUGE ARE NOT REQUIRED AT THE ELEVATOR IN OPEN PARKING GARAGES. NOTE: OWNER PROVIDING EMERGENCY GENERATOR FOR ELEVATOR OPERATION.
AREA OF REFUGE	1009.4.2	THE ELEVATOR SHALL BE ACCESSED FROM AN AREA OF REFUGE COMPLYING WITH SECTION 1009.6.		EXCEPTION 1: AREAS OF REFUGE ARE NOT REQUIRED AT ELEVATOR IN OPEN PARKING GARAGES.
TWO-WAY COMMUNICATIONS	1009.8	A TWO-WAY COMMUNICATION SYSTEM SHALL BE PROVIDED AT THE ELEVATOR LANDING ON EACH ACCESSIBLE FLOOR THAT IS ONE OR MORE STORIES ABOVE OR BELOW THE LEVEL OF EXIT DISCHARGE.	TWO-WAY COMMUNICATION PROVIDED AT ELEVATOR LANDING.	SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION AND LOCATIONS. SEE 1009.8.1 AND 1009.8.2 FOR DETAILED SYSTEM AND SIGNAGE REQUIREMENTS.
DIRECTIONAL SIGNAGE	1009.10	DIRECTIONAL SIGNAGE INDICATING THE LOCATION OF ALL OTHER MEANS OF EGRESS AND WHICH OF THOSE ARE ACCESSIBLE MEANS OF EGRESS SHALL BE PROVIDED AT THE FOLLOWING: 1. AT EXITS SERVING A REQUIRED ACCESSIBLE SPACE BUT NOT PROVIDING AN APPROVED ACCESSIBLE MEANS OF EGRESS. 2. AT ELEVATOR LANDINGS 3. WITHIN AREAS OF REFUGE.	SIGNAGE PROVIDED AT ELEVATOR LANDINGS.	–
DOORS	1010.1.1 1010.1.1.1	SHALL BE SUFFICIENT FOR THE OCCUPANT LOAD THEREOF AND SHALL PROVIDE A CLEAR WIDTH OF 32 INCHES. NO PROJECTIONS LOWER THAN 34 INCHES ABOVE THE FLOOR. BETWEEN 34 AND 80 INCHES PROJECTIONS SHALL NOT EXCEED 4 INCHES.	DOOR CLEAR WIDTH IS EQUAL TO OR GREATER THAN 32 INCHES.	–
	1010.1.2 1010.1.2.1	DOOR SWING SHALL BE PIVOTED OR SIDE HINGED AND SHALL SWING IN THE DIRECTION OF EGRESS TRAVEL WHERE SERVING AN OCCUPANT LOAD OF 50 OR MORE PERSONS.	DESIGN COMPLIES AS REQUIRED	–
	1010.1.5	THERE SHALL BE A FLOOR OR LANDING OF THE SAME ELEVATION ON EACH SIDE OF A DOOR. EXTERIOR LANDINGS PERMITTED TO HAVE MAX. 2-PERCENT SLOPE.	MAXIMUM 2-PERCENT SLOPES PROVIDED AT EXTERIOR DOORS.	–
	1010.1.6	LANDINGS AT DOORS SHALL HAVE A WIDTH OF NOT LESS THAN THE WIDTH OF THE STAIRWAYS OR THE DOOR, WHICHEVER IS GREATER. DOORS IN THE FULLY OPEN POSITION SHALL NOT REDUCE THE REQUIRED DIMENSION BY MORE THAN 7 INCHES. DOOR IN ANY POSITION SHALL NOT REDUCE THE LANDING TO LESS THAN ONE-HALF ITS REQUIRED WIDTH. LANDINGS SHALL HAVE A LENGTH MEASURED IN THE DIRECTION OF TRAVEL OF NOT LESS THAN 44 INCHES.	DESIGN COMPLIES AS REQUIRED	REFER TO ICC/ANSI A117.1 AND 2009 STANDARDS FOR ACCESSIBLE DESIGN FOR REQUIRED DOOR MANEUVERING CLEARANCES TO BE INCLUDED IN PROVIDED LANDINGS.
	1010.1.7	THRESHOLDS AT DOORWAYS SHALL NOT EXCEED 1/2 INCH WITH BEVELS SLOPE NOT TO EXCEED 50-PERCENT.	DESIGN COMPLIES AS REQUIRED	–
STAIRWAYS	1011.2 WIDTH AND CAPACITY	WIDTH PER 1005.1, MIN. 44 INCHES	44 INCHES AT STAIR 1 44 INCHES AT STAIR 2	SEE 1005.3.1 EGRESS WIDTH CALCULATIONS.
	1011.3 HEADROOM	HEADROOM OF NOT LESS THAN 80 INCHES	DESIGN COMPLIES AS REQUIRED	–
	1011.5.2 RISER HGT AND DEPTH	RISER HEIGHT 7 INCHES MAX., 4 INCHES MIN. & TREAD DEPTH 11 INCHES MIN.	DESIGN COMPLIES AS REQUIRED	–
STAIRWAY LANDING	1011.6	LANDING WIDTH SHALL NOT BE LESS THAN THE STAIRWAYS THEY SERVE. MIN. DIMENSION IN THE DIRECTION OF TRAVEL EQUAL TO THE WIDTH OF THE STAIRWAY, NEED NOT EXCEED 48 INCHES WHERE STAIRWAY HAS A STRAIGHT RUN. DOORS OPENING INTO A LANDING SHALL NOT REDUCE THE LANDING TO LESS THAN ONE-HALF THE REQUIRED WIDTH. WHEN FULLY OPEN, THE DOOR SHALL NOT PROJECT MORE THAN 7 INCHES INTO THE LANDING.	DESIGN COMPLIES AS REQUIRED	–
STAIRWAY CONSTRUCTION	1011.7.1	WALKING SURFACE SHALL NOT BE SLOPED STEEPER THAN 2-PERCENT SLOPE.	DESIGN COMPLIES AS REQUIRED	–
	1011.7.2	OUTDOOR STAIRS AND APPROACHES TO STAIRWAYS SHALL BE DESIGNED SO THAT WATER WILL NOT ACCUMULATE ON WALKING SURFACES.	DESIGN COMPLIES AS REQUIRED	–
STAIRWAY VERTICAL RISE	1011.8	A FLIGHT OF STAIRS SHALL NOT HAVE A VERTICAL RISE GREATER THAN 12 FEET BETWEEN TIERS.	DESIGN COMPLIES AS REQUIRED	–

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2606
CERTIFICATE OF AUTHORIZATION AC-438
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CODE ANALYSIS SUMMARY

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-003

	CODE REQUIREMENTS	INTERNATIONAL BUILDING CODE/2018 NJ EDITION, U.N.O.			COMMENTS
		REFERENCE	ALLOWABLE OR REQUIRED	PROVIDED	
MEANS OF EGRESS	HANDRAILS	1011.11	SHALL BE ON BOTH SIDES OF STAIRWAYS COMPLYING WITH SECTION 1012	DESIGN COMPLIES AS REQUIRED	–
	RAMPS	1012.1	EXCEPTION 3. VEHICLE RAMPS IN PARKING GARAGES FOR PEDESTRIAN EXIT ACCESS SHALL NOT BE REQUIRED TO COMPLY WITH SECTIONS 1010.3 THROUGH 1010.9 WHEN THEY ARE NOT AN ACCESSIBLE ROUTE SERVING ACCESSIBLE PARKING SPACES, OTHER REQUIRED ACCESSIBLE ELEMENTS OR PART OF AN ACCESSIBLE MEANS OF EGRESS.	–	–
	EXIT SIGNS	1013.1	NO MORE THAN 100 FEET OR THE LISTED VIEWING DISTANCE FOR THE SIGN, WHICHEVER IS LESS, FROM THE NEAREST VISIBLE EXIT SIGN	DESIGN COMPLIES AS REQUIRED	SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION AND LOCATIONS.
		1013.4	A TACTILE SIGN PER ICC/ANSI A117.1 STATING "EXIT" ADJACENT TO EACH DOOR, AN EXIT STAIRWAY AND THE EXIT DISCHARGE.	DESIGN COMPLIES AS REQUIRED	SEE ARCHITECTURAL PLANS FOR LOCATIONS.
	HANDRAILS	1014.2	HEIGHT 34–38 INCHES	34 INCHES HEIGHT PROVIDED	–
		1014.3	HANDRAILS WITH A CIRCULAR CROSS SECTION SHALL HAVE AN OUTSIDE DIAMETER OF NOT LESS THAN 11/4 INCHES (32 MM) AND NOT GREATER THAN 2 INCHES (51 MM)	1.5 INCH NOMINAL CIRCULAR O.D. PROVIDED.	–
		1014.6	EXTENSIONS SHALL RETURN TO A WALL, GUARD OR THE WALKING SURFACE. EXTENSION 12" AT TOP NOSING (1) TREAD AT BOTTOM NOSING	DESIGN COMPLIES AS REQUIRED	SEE HANDRAIL DETAILS FOR ADDITIONAL INFORMATION.
		1014.7	CLEAR. MIN. 1 1/2 INCHES BET. HANDRAILS AND WALL OR GUARDRAIL	DESIGN COMPLIES AS REQUIRED	SEE HANDRAIL DETAILS FOR ADDITIONAL INFORMATION.
		1014.8	PROJECTIONS SHALL NOT EXCEED 4 1/2 INCH	DESIGN COMPLIES AS REQUIRED	SEE HANDRAIL DETAILS FOR ADDITIONAL INFORMATION.
	GUARDS	1015.3 1013.4	HEIGHT MIN. 42 INCHES OPENINGS LESS THAN 4 INCHES CLEAR	42 INCHES PROVIDED OPNGS < THAN 4 INCHES CLR	–
	EXIT ACCESS TRAVEL DISTANCE WITHOUT SPRINKLER SYSTEM	TABLE 1017.2	OCCUPANCY DISTANCE S–2 400 FT (SPRINKLERED) B 300 FT (SPRINKLERED)	DESIGN COMPLIES AS REQUIRED	SEE LIFE SAFETY PLAN DIAGRAMS FOR ADDITIONAL INFORMATION.
	EXIT ACCESS STAIRWAYS	1019.3	FLOOR OPENINGS CONTAINING EXIT ACCESS STAIRWAYS SHALL BE ENCLOSED WITH A SHAFT ENCLOSURE CONSTRUCTED IN ACCORDANCE WITH SECTION 713.	STAIRWAY ENCLOSURES NOT PROVIDED PER EXCEPTION 6.	1019.3 EXCEPTION 6. EXIT ACCESS STAIRWAYS AND RAMPS IN OPEN PARKING GARAGES THAT SERVE ONLY THE PARKING GARAGE.
	EXITS	1022.1 1022.2.2	ONCE A GIVEN LEVEL OF EXIT PROTECTION IS ACHIEVED, SUCH LEVEL OF PROTECTION SHALL NOT BE REDUCED UNTIL ARRIVAL AT THE EXIT DISCHARGE. EXTERIOR EXIT DOORS SHALL LEAD DIRECTLY TO THE EXIT DISCHARGE OR THE PUBLIC WAY.	DESIGN COMPLIES AS REQUIRED	–
	INTERIOR EXIT STAIRWAYS	1023.2	2 HOUR FIRE–RESISTANCE RATING WHERE CONNECTING FOUR OR MORE STORIES	NOT PROVIDED	ENCLOSURE OF VERTICAL OPENINGS NOT REQUIRED PER 406.5.9 AND 1019.3 EXCEPTION 6.
		1023.3	EXIT ENCLOSURES SHALL TERMINATE AT AND EXIT DISCHARGE OR PUBLIC WAY.	UNENCLOSED STAIRWAYS TERMINATE AT EXIT DISCHARGE	–
	EXIT ENCLOSURES	1023.9 1023.9.1	FLOOR IDENTIFICATION SIGNS SHALL BE PROVIDED AT EACH FLOOR LANDING.	DESIGN COMPLIES AS REQUIRED	SEE 1023.9 AND 1023.9.1 FOR REQUIRED SIGN DETAILS.
			AN ADDITIONAL TACTILE FLOOR IDENTIFICATION SIGN SHALL BE LOCATED AT EACH FLOOR LEVEL LANDING ADJACENT TO THE DOOR LEADING FROM THE ENCLOSURE.	DESIGN COMPLIES AS REQUIRED	
	EXIT DISCHARGE	1028.1000	DISCHARGE DIRECTLY TO THE EXTERIOR OF THE BUILDING, AT GRADE OR HAVE DIRECT ACCESS TO GRADE. SHALL NOT REENTER A BUILDING.	DESIGN COMPLIES AS REQUIRED	–
GLASS & GLAZING	HAZARDOUS LOCATIONS	2406.4.1 THRU 2406.4.7	SPECIFIC HAZARDOUS LOCATIONS INCLUDE: GLAZING IN DOORS, ADJACENT TO A DOOR, ADJACENT TO STAIRS AND ADJACENT TO THE BOTTOM OF A STAIRWAY LANDING.	DESIGN COMPLIES AS REQUIRED	SEE SECTION 2406.4 FOR SPECIFIC REQUIREMENTS BY LOCATION.
	GLASS IN HOISTWAYS AND ELEVATOR CARS	2409.2	GLASS IN ELEVATOR HOISTWAY ENCLOSURES SHALL BE LAMINATED GLASS...	DESIGN COMPLIES AS REQUIRED	–
		2409.4	GLASS IN ELEVATOR CAR ENCLOSURES SHALL BE LAMINATED GLASS...	DESIGN COMPLIES AS REQUIRED	–
ELEVATORS	ENCLOSURES	3002.1	ENCLOSURE PROTECTION. ELEVATOR HOISTWAY ENCLOSURES SHALL BE SHAFT ENCLOSURES COMPLYING WITH SECTION 712 AND 713	ENCLOSURE PROTECTION NOT PROVIDED.	NO HOISTWAY ENCLOSURE REQUIRED IN OPEN PARKING GARAGES PER 712.1.10.2, THEREFORE NO ENCLOSURE PROTECTION IS REQUIRED.
		3002.4	ELEVATOR CAR TO ACCOMMODATE AN AMBULANCE STRETCHER 24 INCHES BY 84 INCHES WITH MIN. 5" RADIUS CORNERS IN THE HORIZONTAL POSITION.	ELEVATOR CAB MEETS STRETCHER REQUIREMENTS.	–
		3002.8	GLASS IN ELEVATOR ENCLOSURES SHALL COMPLY WITH SECTION 2409.2.	LAMINATED GLASS PROVIDED FOR GLASS BACK CAB.	–
	EMERGENCY OPERATIONS	3003.1	WHERE STANDBY POWER IS REQUIRED TO OPERATE AN ELEVATOR, THE OPERATION SHALL BE IN ACCORDANCE WITH SECTIONS 3003.1.1 THROUGH 3003.1.4.	STANDBY POWER PROVIDED.	SEE SECTION 1009.2.1. NOTE: OWNER PROVIDING EMERGENCY GENERATOR FOR ELEVATOR OPERATION.
	MACHINE ROOMS AND MACHINERY SPACES	3005.4	FIRE–RESISTANCE RATING SHALL NOT BE LESS THAN THE REQUIRED RATING OF THE HOISTWAY ENCLOSURE SERVED BY THE MACHINERY.	2 HOUR FIRE–RESISTANCE RATING PROVIDED.	–
ACCESSIBILITY (NJAC 5:23–7 BARRIER–FREE SUBCODE AND IBC–NJ)	PARKING AND PASSENGER LOADING	5:23–7.10(a)	ACCESSIBLE PARKING SPACES SHALL BE LOCATED ON THE SHORTEST ACCESSIBLE ROUTE OF TRAVEL FROM ADJACENT PARKING TO AN ACCESSIBLE BUILDING ENTRANCE. WITH MULTIPLE ACCESSIBLE ENTRANCES, THE PARKING SPACES SHALL BE DISPERSED AND LOCATED NEAR THE ACCESSIBLE ENTRANCES.	DESIGN COMPLIES AS REQUIRED	5:23–7.10(i): VAN ACCESSIBLE SPACES ARE PERMITTED TO EXIST ON ONE LEVEL. VAN ACCESSIBLE PARKING SPACES LOCATED ON GROUND TIER. ALL OTHER ACCESSIBLE PARKING SPACES LOCATED IN CLOSE PROXIMITY TO STAIR/ELEVATOR NO.1 LOBBY FOR ACCESS TO PEDESTRIAN BRIDGE.
		TABLE 1106.1	2% OF TOTAL PARKING SPACES	DESIGN COMPLIES AS REQUIRED	SEE A1.1 FOR ACCESSIBLE SPACE TABULATION.
		1106.5 ADASAD 208.2.4	FOR EVERY SIX OR FRACTION THERE OF AT LEAST ONE SHALL BE VAN–ACCESSIBLE	DESIGN COMPLIES AS REQUIRED	SEE A1.1 FOR ACCESSIBLE SPACE TABULATION.
		1106.6	ACCESSIBLE PARKING SPACES...SHORTEST ACCESSIBLE ROUTE TO TRAVEL FROM ADJACENT PARKING TO AND ACCESSIBLE BUILDING ENTRANCE...DO NOT SERVE A PARTICULAR BUILDING...THE SHORTEST ROUTE TO AN ACCESSIBLE PEDESTRIAN ENTRANCE TO THE FACILITY.	DESIGN COMPLIES AS REQUIRED	SEE ARCHITECTURAL PLANS FOR ACCESSIBLE PARKING SPACE LOCATIONS.
	GENERAL ACCESSIBILITY REQUIREMENTS		REFER TO ADASAD AND ICC/ANSI A117.1 FOR GENERAL ACCESSIBILITY REQUIREMENTS	DESIGN COMPLIES AS REQUIRED	–

CODE REQUIREMENTS	INTERNATIONAL BUILDING CODE/2018 NJ EDITION, U.N.O.			COMMENTS
	REFERENCE	ALLOWABLE OR REQUIRED	PROVIDED	
WALL AND CEILING FINISHES	TABLE 803	CLASS A: = FLAME SPREAD INDEX 0–25; SMOKE–DEVELOPED INDEX 0–450. CLASS B: = FLAME SPREAD INDEX 26–75; SMOKE–DEVELOPED INDEX 0–450. CLASS C: = FLAME SPREAD INDEX 76–200; SMOKE–DEVELOPED INDEX 0–450.	DESIGN COMPLIES AS REQUIRED	–
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY	TABLE 803.13	GROUP B: SPRINKLERED –INTERIOR EXIT STAIRWAYS, INTERIOR EXIT RAMPS, EXIT PASSAGEWAYS: B – CORRIDORS / EXIT ACCESS: C – ROOMS AND ENCLOSED SPACES: C	DESIGN COMPLIES AS REQUIRED	–
INTERIOR FLOOR FINISH REQUIREMENTS	804.4	INTERIOR FLOOR COVERING MATERIALS SHALL COMPLY WITH SECTIONS 804.4.1 AND 804.4.2 AND INTERIOR FLOOR FINISH MATERIALS SHALL COMPLY WITH SECTION 804.4.2.	DESIGN COMPLIES AS REQUIRED	–
INSULATION	807.1	THERMAL AND ACOUSTICAL INSULATION SHALL COMPLY WITH SECTION 720.	DESIGN COMPLIES AS REQUIRED	–
ACOUSTICAL CEILING SYSTEMS	808.1	THE QUALITY, DESIGN, FABRICATION AND ERECTION OF METAL SUSPENSION SYSTEMS FOR ACOUSTICAL TILE AND LAY–IN PANEL CEILINGS IN BUILDINGS OR STRUCTURES SHALL CONFORM TO GENERALLY ACCEPTED ENGINEERING PRACTICE, THE PROVISIONS OF THIS CHAPTER AND OTHER APPLICABLE REQUIREMENTS OF THIS CODE.	DESIGN COMPLIES AS REQUIRED	–

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CODE ANALYSIS SUMMARY

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

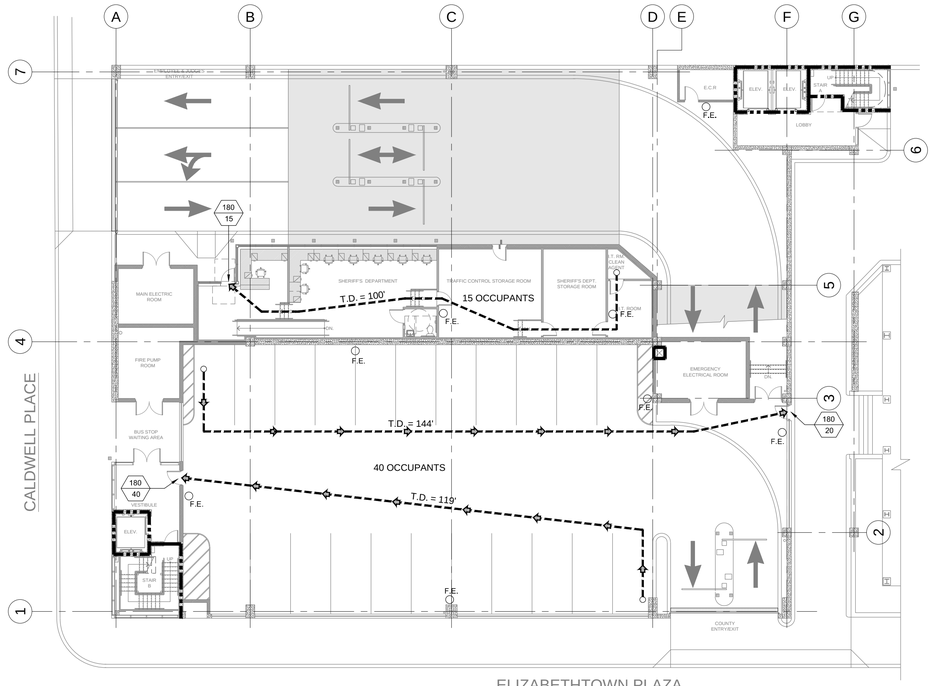
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

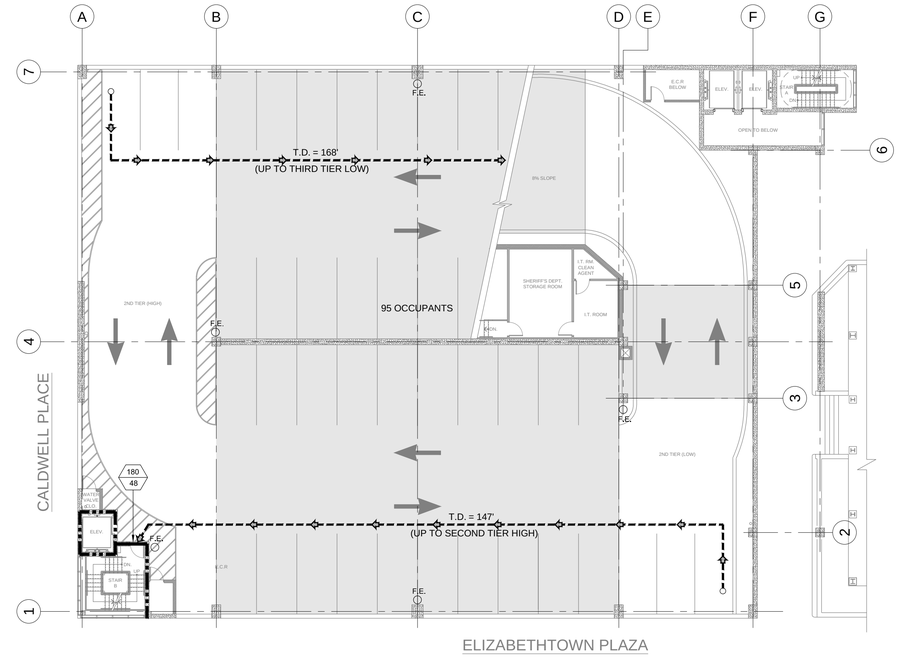
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

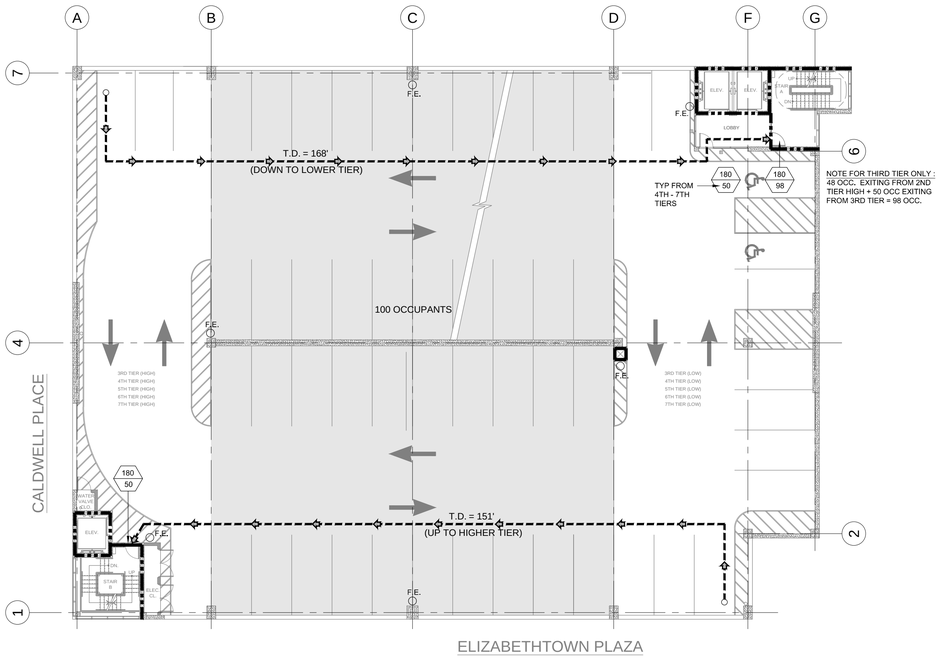
A-004



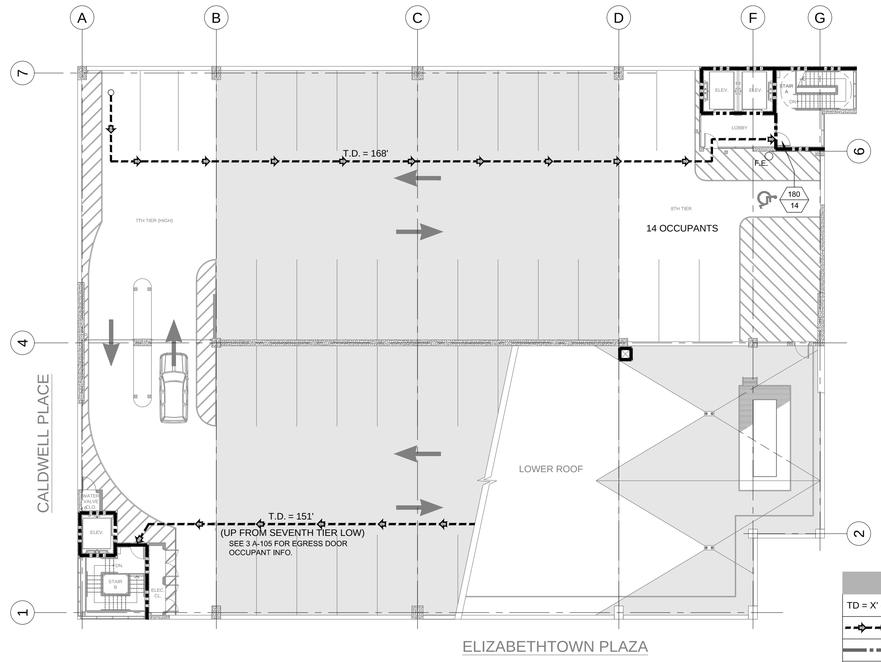
1 A-100 **FIRST TIER EGRESS PLAN**
SCALE: 1/16"=1'-0"



2 A-101 **SECOND TIER EGRESS PLAN**
SCALE: 1/16"=1'-0"



3 A-102 **THIRD - SEVENTH TIER EGRESS PLAN**
SCALE: 1/16"=1'-0"



4 A-105 **EIGHTH TIER EGRESS PLAN**
SCALE: 1/16"=1'-0"

LEGEND	
TD = X' - X"	TRAVEL DISTANCE
	EGRESS PATH
	1-HOUR RATED WALL
	2-HOUR RATED WALL
XXX / XXX	EGRESS CAPACITY (OCCUPANTS) / ACTUAL EGRESS OCCUPANTS
F.E.	WALL MOUNTED FIRE EXTINGUISHER
F.E.	RECESSED FIRE EXTINGUISHER CABINET

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CODE ANALYSIS-
LIFE SAFETY PLAN
DIAGRAMS

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

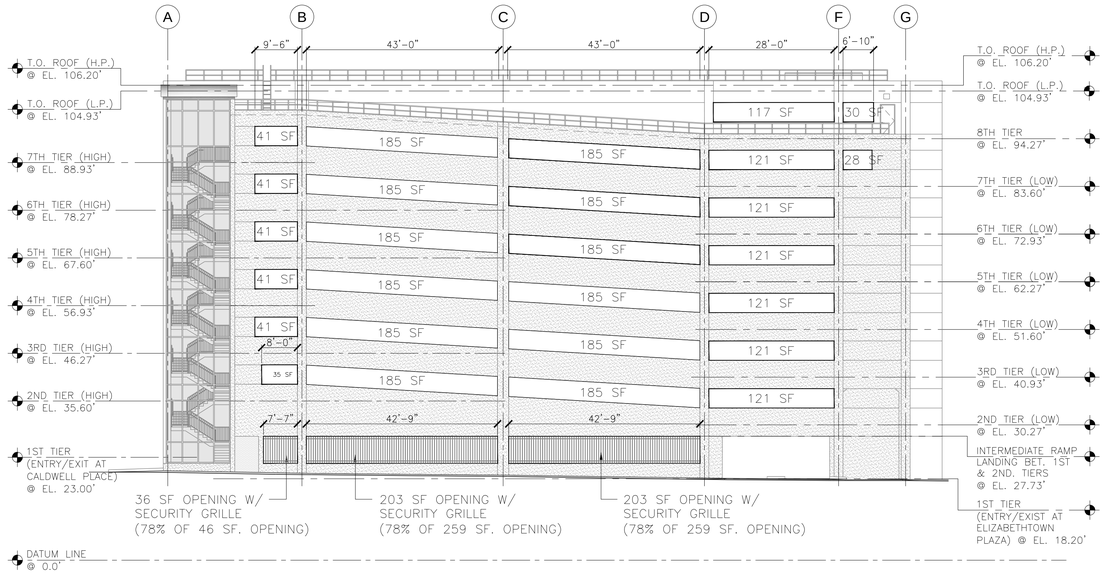
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

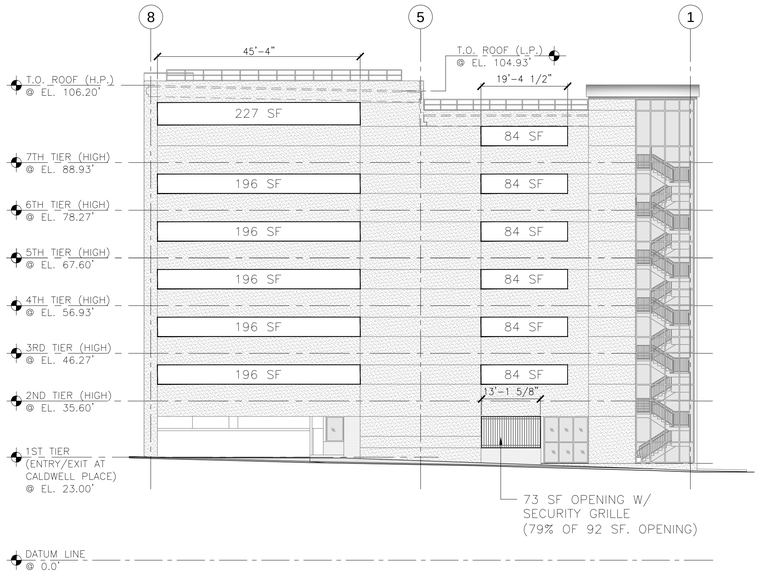
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

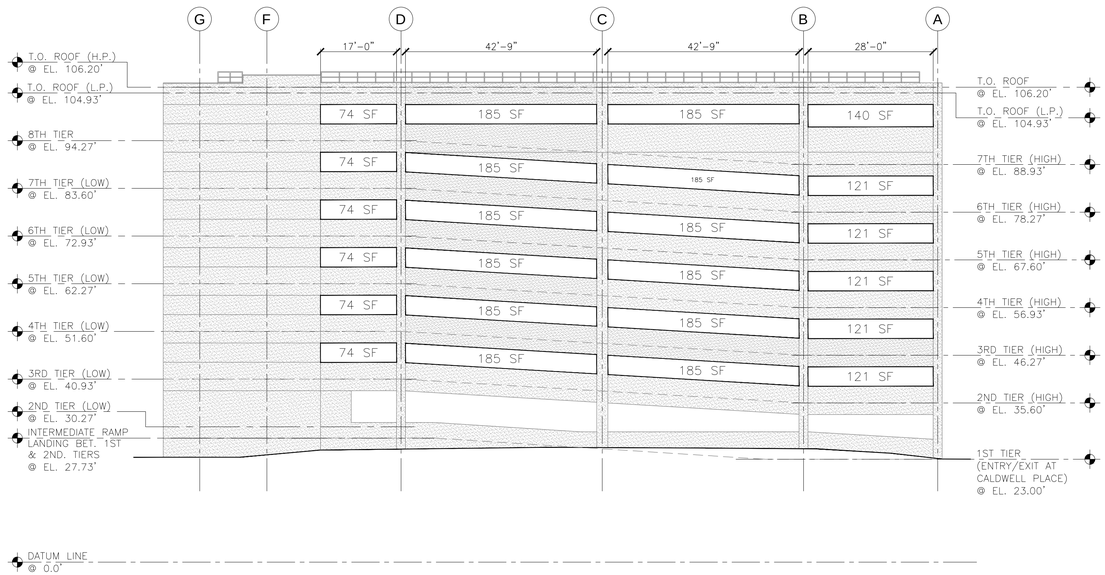
A-005



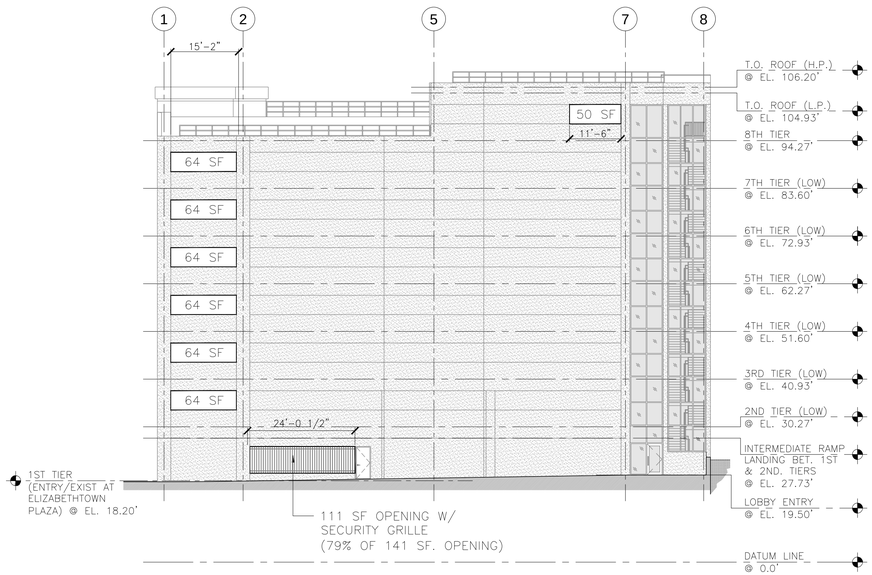
A A-200 **WEST BUILDING ELEVATION** (PRIMARY FACADE - ELIZABETHTOWN PLAZA)
SCALE: 1/16" = 1'-0"



A A-202 **NORTH BUILDING ELEVATION** (CALDWELL PLACE)
SCALE: 1/16" = 1'-0"



A A-203 **EAST BUILDING ELEVATION** (FACING CEMETERY)
SCALE: 1/8" = 1'-0"



A A-204 **SOUTH BUILDING ELEVATION** (FACING ANNEX BUILDING)
SCALE: 1/8" = 1'-0"

WALL AREA					
TIER	NORTH ELEV.	SOUTH ELEV.	EAST ELEV.	WEST ELEV.	TOTAL AREA
1ST. TIER	526	581	0	1873	2,980
2ND. TIER	1010	1106	1483	1386	4,985
3RD. TIER	1010	1106	1483	1639	5,238
4TH. TIER	1010	1106	1483	1639	5,238
5TH. TIER	1010	1106	1483	1639	5,238
6TH. TIER	1010	1106	1483	1639	5,238
7TH. TIER	1423	1106	1849	2677	7,055
8TH. TIER	0	507	215	635	1,357

OPENNESS SUMMARY (IBC)								
OPEN AREA CALCULATION								
	1ST. TIER	2ND. TIER	3RD. TIER	4TH. TIER	5TH. TIER	6TH. TIER	7TH. TIER	8TH. TIER
TOTAL WALL AREA	2,980	4,985	5,238	5,238	5,238	5,238	7,055	1,357
REQUIRED S.F. OPEN (20% OF TOTAL S.F.)	596	997	1,048	1,048	1,048	1,048	1,411	271
PROVIDED S.F. OPEN	626	1,435	1,441	1,441	1,441	1,441	1,445	271
PROVIDED > REQUIRED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED
DISTRIBUTION OF OPENINGS CALCULATION								
TOTAL TIER PERIMETER (LN. FT.)	221.72	467.37	491.0	491.0	491.0	491.0	493.5	113.6
REQUIRED L.F. OPEN (40% OF TOTAL L.F.)	88.68	186.9	196.4	196.4	196.4	196.4	197.4	45.0
PROVIDED L.F. OPEN	130.42	331.87	333.37	333.37	333.37	333.37	322.8	45.0
PROVIDED > REQUIRED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED	SATISFIED

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CODE ANALYSIS- OPENNESS DIAGRAMS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

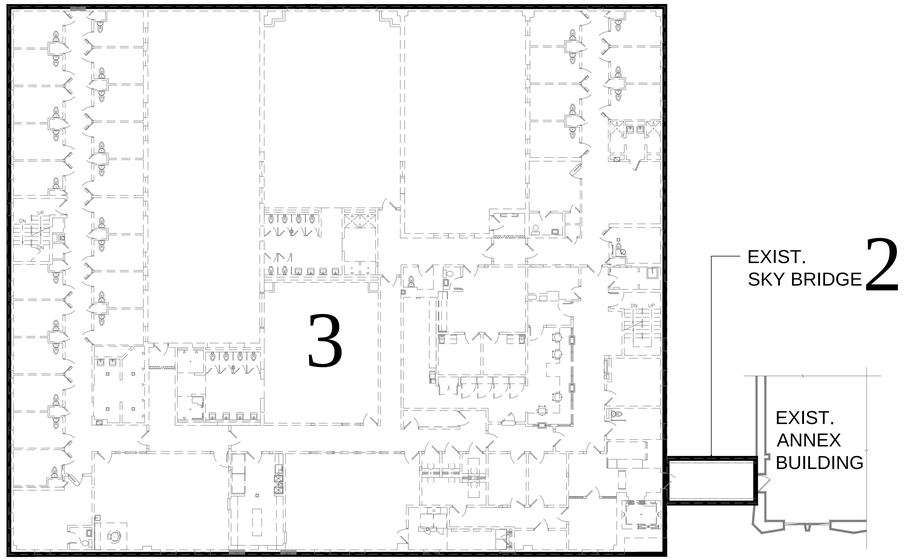
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

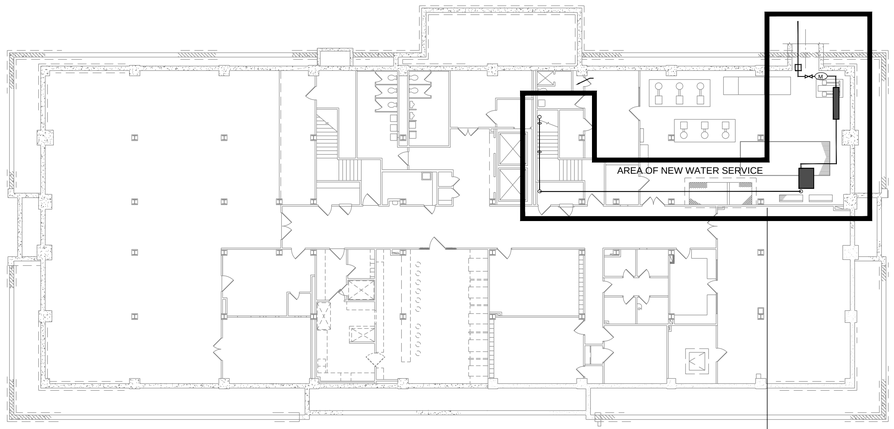
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

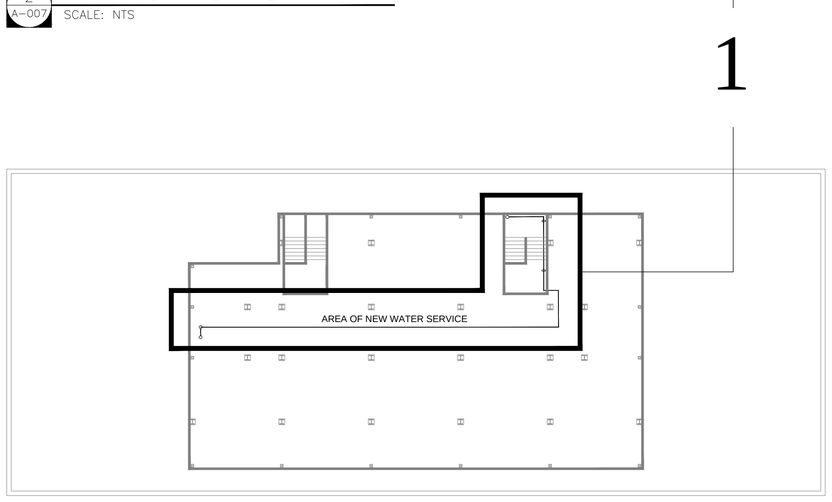
A-006



1 A-007 EXISTING PARKING DECK
SCALE: NTS



2 A-007 ANNEX BUILDING - BASEMENT PLAN
SCALE: NTS



3 A-007 ANNEX BUILDING - PENTHOUSE PLAN
SCALE: NTS

PHASING NOTES

PHASE 1 – INSTALLATION OF NEW WATER SERVICE IN THE EXISTING ANNEX BUILDING

- INSTALL NEW WATER SUPPLY FROM STREET TIE–IN TO ANNEX BASEMENT.
- INSTALL NEW METER, BACKFLOW PREVENTER AND BOOSTER PUMP IN ANNEX BASEMENT.
- INSTALL NEW WATER MAIN FROM BASEMENT TO PENTHOUSE.
- SHUT OFF ANNEX WATER SERVICE IN GARAGE BASEMENT IN PREPARATION FOR NEW ANNEX SYSTEM TIE–IN.
- DRAIN, DISCONNECT AND CAP EXISTING CITY WATER SUPPLY FROM GARAGE IN CEILING OF ANNEX 4TH FLOOR JURY ROOM.
- DRAIN, DISCONNECT AND CAP EXISTING DHW AND DHWR IN CEILING OF ANNEX 4TH FLOOR JURY ROOM. THIS PIPING PREVIOUSLY SUPPLIED DOMESTIC HOT WATER TO THE GARAGE TOP FLOOR JUVENILE CENTER.
- TIE–IN NEW ANNEX WATER MAIN IN PENTHOUSE AS SHOWN ON ANNEX NEW WATER SERVICE DRAWINGS.

PHASE 2 – DEMOLITION OF THE EXISTING SKY BRIDGE

- ONCE ANNEX PIPING MODIFICATIONS ARE COMPLETED, DEMOLISH ALL WATER PIPING UNDER FLOOR OF SKY BRIDGE IN PREPARATION OF DEMOLITION OF STRUCTURE. PIPING INCLUDES DOMESTIC COLD WATER SUPPLY, DOMESTIC HOT WATER SUPPLY, DOMESTIC HOT WATER RETURN AMD FIRE PROTECTION WATER SUPPLY.
- ELECTRICAL CONTRACTOR SHALL IDENTIFY AND DISCONNECT ANY INCIDENTAL LINE/LOW VOLTAGE SYSTEMS AND ASSOCIATED EXISTING INFRASTRUCTURE CONTAINED WITHIN THE SKYBRIDGE AND DERIVED FROM THE ANNEX BUILDING. CONTRACTOR SHALL COORDINATE SEALANT OF WALL PENETRATIONS AND SAFE OFF/LABEL IN RESPECTIVE PANELS IN THE ANNEX BUILDING.
- REMOVE ALL HAZARDOUS MATERIAL AND DEMOLISH SKYBRIDGE STRUCTURE IN ITS ENTIRETY AFTER THE DEMOLITION OF ALL THE ITEMS ABOVE.

PHASE 3 – DEMOLITION OF EXISTING PARKING DECK

- DEMOLISH ALL EXISTING PLUMBING AND FIRE PROTECTION PIPING AS NOTED ON DRAWING PD–100 "PLUMBING EXISTING GARAGE BASEMENT DEMOLITION PLAN".
- DEMOLISH ALL EXISTING UNDERGROUND ELECTRICAL, FIRE ALARM AND COMMUNICATIONS SYSTEMS AS NOTED ON DRAWING ED–200 "ELECTRICAL EXISTING GARAGE BASEMENT DEMOLITION PLAN".
- REMOVE ALL HAZARDOUS INCLUDING ASBESTOS AS INCLUDED ON THE SPECIFICATIONS.
- DEMOLISH BUILDING STRUCTURE IN ITS ENTIRETY. REFER TO DEMOLITION NOTES ON SHEET AD–100 AND SHEETS AD–101, AD–102, AD–103 AND AD–104 FOR MORE INFORMATION.

NOTE:

THE WORK SHALL BE PHASED IN ACCORDANCE WITH THE PHASING PLANS AND NOTES. THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONSTRUCTION MANAGER AT LEAST TWO WEEKS IN ADVANCE OF STARTING THE NEXT PHASE. ANY DEVIATION FROM THE PHASING PLANS SHALL BE APPROVED BY THE OWNER AND CONSTRUCTION MANAGER. ALL WORK IN A SPECIFIC PHASE MUST BE ENTIRELY COMPLETED PRIOR TO STARTING THE NEXT PHASE.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

PHASING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-007

SITE PLANS

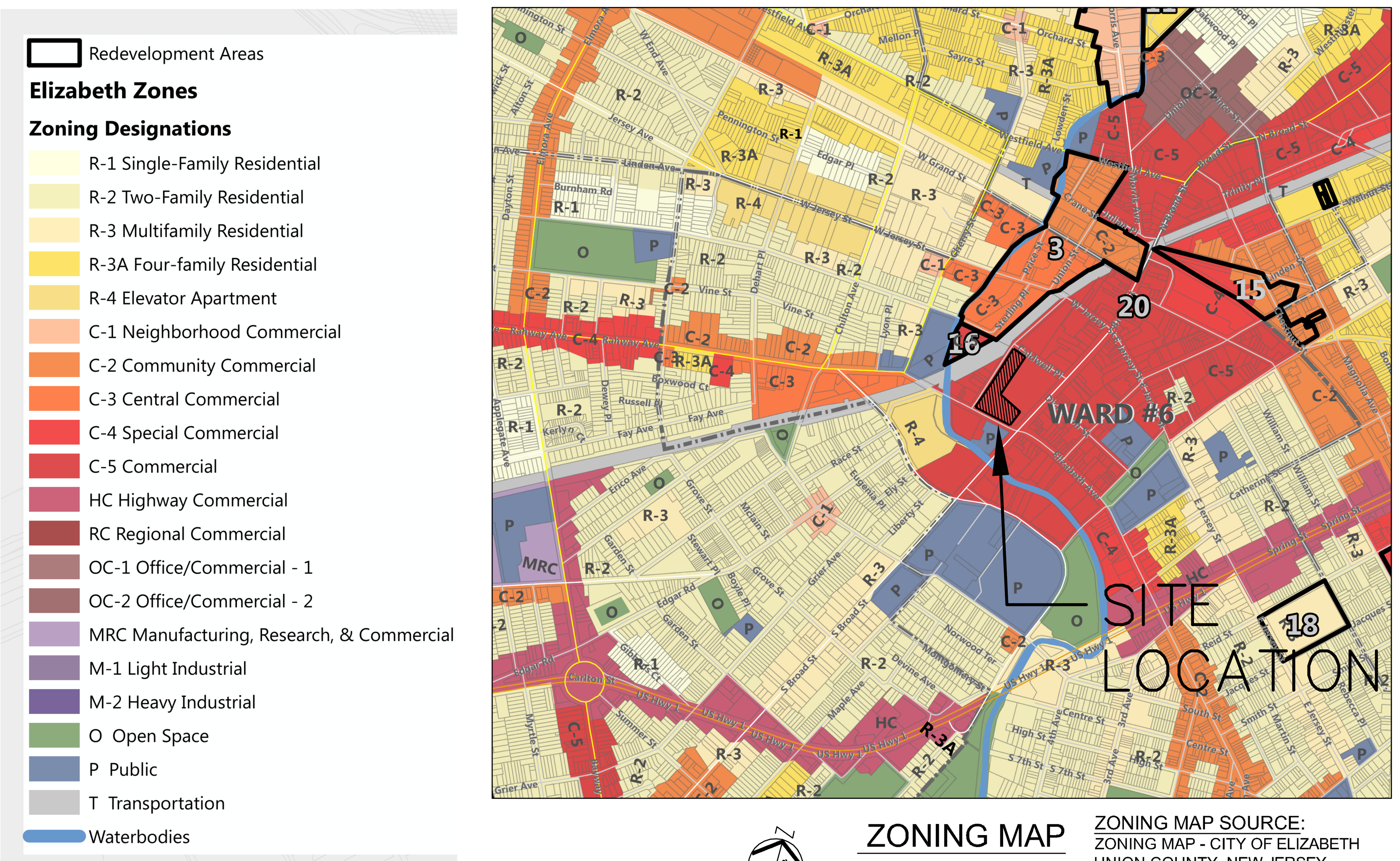
FOR

PARKING DECK UNION COUNTY JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91

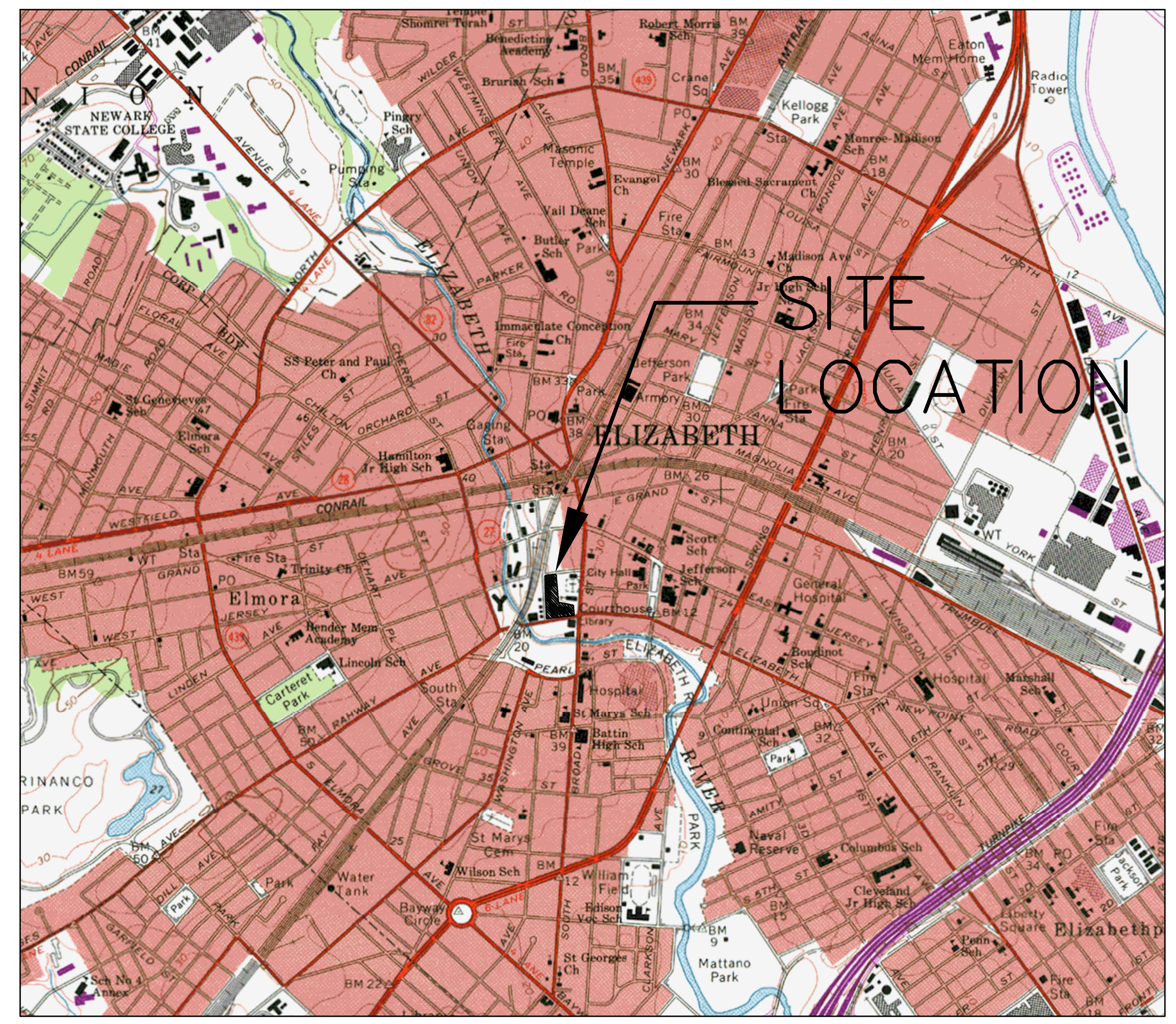
CITY OF ELIZABETH, UNION COUNTY, NEW JERSEY

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	02/24/21	REVISED ZONING CHART
3	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
4	06/04/21	ISSUED FOR BIDDING
5	07/28/21	ISSUED FOR BIDDING



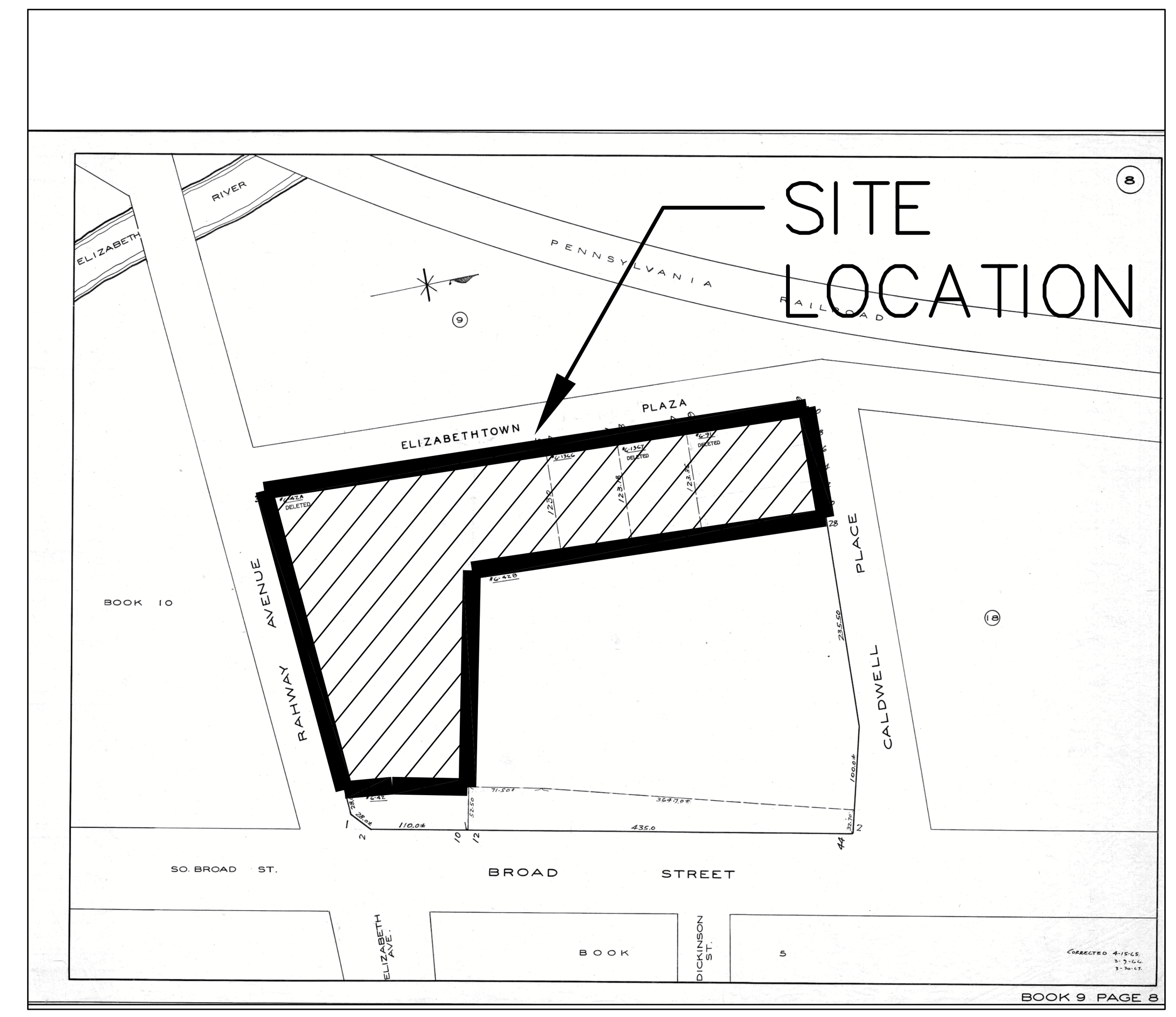
ZONING MAP
SCALE: 1"=1000'

ZONING MAP SOURCE:
ZONING MAP - CITY OF ELIZABETH
UNION COUNTY, NEW JERSEY
LAST REVISED JULY 16, 2019



USGS MAP
SCALE: 1"=2000'

USGS MAP SOURCES:
ELIZABETH, NEW JERSEY, DATED 1983



TAX MAP
SCALE: 1"=160'

TAX MAP SOURCES:
TAX MAP 8
CITY OF ELIZABETH,
UNION COUNTY, NJ

ZONING REQUIREMENTS

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
(C5 ZONE)
COMMERCIAL ZONE

ITEM	REQUIRED	EXISTING	PROPOSED	VARIANCE REQUIRED
LOT AREA (MIN.)	6,000 SQFT	122,188 SQFT	122,188 SQFT	NO
MINIMUM LOT WIDTH	40 FT	621 FT	621 FT	NO
MINIMUM LOT DEPTH	150 FT	125.21 FT (CALDWELL PLACE)	125.21 FT (CALDWELL PLACE)	ENC
MINIMUM FRONT YARD SETBACK	0.1 FT (PREVAILING)	0.1 FT	0.1 FT	NO
MINIMUM SIDE YARD SETBACK	0.1 FT (PREVAILING)	0.1 FT	0.1 FT	NO
MINIMUM REAR YARD SETBACK	N/A (PREVAILING)	N/A	N/A	NO
MAX BUILDING COVERAGE AND IMPERVIOUS COVERAGE	100%	100%	100%	NO
BUILDING HEIGHT (MAX.)	3 STORIES/35 FT	7 STORIES/66.5 FT	9 STORIES/96.26 FT *	YES
PARKING REQUIREMENT	N/A	314 STALLS	450 STALLS	NO

ENC: EXISTING NON CONFORMANCE
* BUILDING HEIGHT WAS MEASURED FROM EXISTING AVERAGE GRADE (20.11) TO TOP OF ROOF ELEVATION (116.37)

CIVIL DRAWING LIST

DWG. NO.	DRAWING TITLE	SCALE	ISSUE DATE	LAST REV. DATE
C-1	COVER SHEET	AS SHOWN	01/11/21	07/28/21
C-2	GENERAL NOTES AND LEGEND	AS SHOWN	01/11/21	07/28/21
C-3	EXISTING CONDITIONS SITE PLAN	1"=20'	01/11/21	07/28/21
C-4	DEMOLITION PLAN	1"=20'	01/11/21	07/28/21
C-5	SITE PLAN	1"=20'	01/11/21	07/28/21
C-6	GRADING AND UTILITY PLAN	1"=20'	01/11/21	07/28/21
C-7	SITE LIGHTING PLAN	1"=20'	01/11/21	07/28/21
C-8	SOIL EROSION AND SEDIMENT CONTROL PLAN	1"=20'	01/11/21	07/28/21
C-9	SOIL EROSION AND SEDIMENT CONTROL DETAILS	AS SHOWN	01/11/21	07/28/21
C-10	SITE DETAILS	AS SHOWN	01/11/21	07/28/21
C-11	LIGHTING DETAILS	AS SHOWN	01/11/21	07/28/21
C-12	UTILITY DETAILS	AS SHOWN	01/11/21	07/28/21

LIST OF PERMITS/APPROVALS REQUIRED

AGENCY	PERMIT / APPROVALS	STATUS
CITY OF ELIZABETH PLANNING BOARD	COURTESY SITE PLAN REVIEW	SUBMITTED
SOMERSET-UNION SOIL CONSERVATION DISTRICT	SOIL EROSION AND SEDIMENT CONTROL CERTIFICATION	TO BE SUBMITTED

PROPERTY OWNER
UNION COUNTY
10 ELIZABETHTOWN PLAZA
ELIZABETH, NJ 07202

CIVIL ENGINEER / SURVEYOR:
PAULUS SOKOLOWSKI AND SARTOR, LLC
3 MOUNTAINVIEW ROAD
WARREN, NJ 07059
TELEPHONE: (732) 560-9700

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR, LLC. OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.

ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT.

THE COPYING AND/OR MODIFICATION OF THIS DOCUMENT OR ANY PORTION THEREOF WITHOUT THE WRITTEN PERMISSION OF PAULUS, SOKOLOWSKI AND SARTOR, LLC. IS PROHIBITED.

UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE", THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR IMPROVEMENTS DEPICTED HEREIN, CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE
COVER SHEET

PROJECT NO.: 03009-003
DRAWN BY: AM
SCALE: AS SHOWN
CHECKED BY: PAR
DATE: 11-30-2020
SHEET OF
SHEET NO.
C-1

REFERENCE AND BASE INFORMATION NOTES

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN IS PER PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S LLC., DATED 10/12/2020.
2. HORIZONTAL CONTROL IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. EXCEPT WHERE SPECIFICALLY NOTED, EXISTING FEATURES ARE SHOWN IN HALF TONE AND PROPOSED FEATURES ARE SHOWN IN FULL TONE.
4. GEOTECHNICAL INVESTIGATION REPORT, PREPARED BY REMINGTON & VERNICK ENGINEERS, DATED DECEMBER 14, 2020.

GENERAL NOTES

1. THE OFFICE OF THE MUNICIPAL ENGINEER SHALL BE NOTIFIED IN ADVANCE OF COMMENCEMENT OF CONSTRUCTION OF ANY IMPROVEMENTS UNDER ITS JURISDICTION.
2. CONTRACTOR SHALL COORDINATE UTILITY MARKOUTS 72 HOURS PRIOR TO ANY DISTURBANCE.
3. ALL SOIL EROSION CONTROL MEASURES MUST BE INSTALLED PRIOR TO THE START OF ANY CONSTRUCTION AND ARE SUBJECT TO INSPECTION BY THE LOCAL SOIL CONSERVATION DISTRICT.
4. THE CONTRACTOR SHALL PROVIDE SUCH TEMPORARY DRAINAGE, SOIL EROSION, AND DUST CONTROL MEASURES AS MAY BE DIRECTED BY THE MUNICIPAL ENGINEER OR OTHER AGENCIES OR DEPARTMENTS TO SATISFY ENVIRONMENTAL CONCERNS.
5. THE INSTALLATION OF UTILITIES MUST BE COORDINATED WITH BUILDING IMPROVEMENTS TO ASSURE THE WELL-BEING OF LIFE AND PROPERTY DURING CONSTRUCTION. WATER SERVICE IS A PRIMARY NEED AND MUST BE SCHEDULED ACCORDINGLY. WATER SUPPLY AND HYDRANT CONNECTIONS ARE TO BE ESTABLISHED AS A PRIORITY DURING INITIAL SITE DEVELOPMENT TO ASSURE ADEQUATE WATER FOR FIREFIGHTING DURING ALL PHASES OF CONSTRUCTION.
6. AS INDICATED IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SUFFICIENT CONSTRUCTION WARNING SIGNS ARE TO BE PROVIDED AND MAINTAINED BY CONTRACTORS PERFORMING CONSTRUCTION WORK. SAID SIGNS ARE TO BE MAINTAINED UNTIL CONSTRUCTION IS COMPLETED AND APPROVED BY THE APPROPRIATE MUNICIPAL INSPECTION PERSONNEL. NO CONSTRUCTION THAT IN ANY WAY INTERFERES WITH ROADWAY TRAFFIC SHALL COMMENCE UNTIL THE APPROPRIATE CONSTRUCTION WARNING SIGNS ARE INSTALLED AND INSPECTED BY THE MUNICIPAL ENGINEER. ALL SUCH SIGNAGE, STRIPING, PARKING AND TRAFFIC CIRCULATION SHALL BE IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", AS AMENDED, AS WELL AS THE REQUIREMENTS OF THE MUNICIPALITY AND NJDOT.
7. CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE MUNICIPAL CONSTRUCTION GUIDELINES FOR STREET OPENINGS WITHIN THE PUBLIC RIGHT OF WAY.
8. ALL ROADWAYS ARE TO BE PASSABLE FOR FIRE DEPARTMENT USE DURING CONSTRUCTION. ANY ROADWAY CLOSURE OR RELOCATION SHALL BE COORDINATED BY THE CONTRACTOR WITH THE FIRE DEPARTMENT TO ENSURE ADEQUATE FIRE PROTECTION FOR ALL AREAS AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING WARNING SIGNS, BARRICADES, AND ANY AND ALL SAFETY MEASURES AS MAY BE REQUIRED BY LOCAL CODES, OSHA AND/OR MUTCD.
9. LOCATION OF EXISTING INLETS, CATCH BASINS AND MANHOLES MUST BE FIELD VERIFIED BEFORE WORK MAY COMMENCE. ANY CONFLICTING INFORMATION FROM THAT SHOWN SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER.
10. SUBSTITUTIONS OF PROPRIETARY MATERIAL AND/OR PRODUCT SPECIFICATIONS THAT NOTE "OR EQUAL" MUST BE APPROVED BY THE DESIGN ENGINEER. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DEMONSTRATE TO THE SATISFACTION OF THE DESIGN ENGINEER THAT THE SUBSTITUTION IS EQUAL.
11. IT IS NOT THE INTENT OF THESE PLANS TO PROVIDE REINFORCING STEEL AND CONCRETE DESIGNS FOR ANY PRE-CAST OR POURED-IN-PLACE CONCRETE STRUCTURES, OTHER THAN THE REINFORCING STEEL AND CONCRETE DESIGNS SPECIFICALLY NOTED ON THESE PLANS. ANY REINFORCING STEEL AND CONCRETE DESIGN MUST BE SUPPLIED, SIGNED & SEALED BY THE PRE-CAST MANUFACTURER OR A REPUTABLE LICENSED STRUCTURAL ENGINEER IN THE STATE OF NEW JERSEY REPRESENTING THE CONTRACTOR AND SHALL BE INCLUDED IN THE SHOP DRAWING SUBMITTAL SUBJECT TO REVIEW BY PS&S.
12. THE CONTRACTOR SHALL PREPARE AS-BUILT DRAWINGS FOR ALL IMPROVEMENTS INSTALLED DURING CONSTRUCTION, ETC. AS-BUILT DRAWINGS MUST BE SIGNED & SEALED BY A NJ PROFESSIONAL LAND SURVEYOR. THE AS-BUILT SURVEY DRAWINGS MUST COMPLY WITH UTILITY OWNER STANDARDS/REQUIREMENTS. COPIES SHALL BE SUBMITTED TO UTILITY COMPANY AND/OR OWNER.
13. ALL CONSTRUCTION SHOWN HEREIN SHALL CONFORM TO THE CITY OF ELIZABETH AND/OR COUNTY OF UNION STANDARDS, CONSTRUCTION DETAILS, AND SPECIFICATIONS APPLICABLE AS WELL AS THE NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, UNLESS SPECIFICALLY NOTED OTHERWISE. IN CASE OF CONFLICT, THE MORE RESTRICTIVE SHALL GOVERN. CONTRACTOR SHALL NOTIFY DESIGN ENGINEER OF ALL CONFLICTS.
14. CONTRACTOR TO REPLACE CONCRETE AROUND UTILITY STRUCTURES AS REQUIRED.

NOTES ON THE USE OF PLANS

1. UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE," THESE DRAWINGS OR THE IMPROVEMENTS DEPICTED HEREIN SHALL NOT BE USED FOR CONSTRUCTION. CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.
2. ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.
3. INFORMATION FOR DESIGN LAYOUT IS CONTAINED SOLELY IN THE WRITTEN DIMENSIONS, BEARINGS, AND ANGLES CONTAINED ON THE DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS..
4. THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT. THE COPYING AND/OR MODIFICATION OF THIS DOCUMENT OR ANY OTHER PORTION THEREOF WITHOUT THE WRITTEN PERMISSION OF PAULUS, SOKOLOWSKI, AND SARTOR IS PROHIBITED.
5. THIS DIMENSIONAL INFORMATION IS NOT WARRANTED NOR SHOULD IT BE CONSIDERED AS COMPLETE FOR EVERY ASPECT OF THE LAYOUT. STANDARD PRACTICE REQUIRES THAT THE LAYOUT PERSON CHECK THE DIMENSIONAL DATA CONSISTENCY AND TO MAKE SURVEY CALCULATIONS WHICH ARE CUSTOMARY FOR CONSTRUCTION LAYOUT. IN THE EVENT A QUESTION OR INCONSISTENCY IS DISCOVERED, THE USER SHOULD IMMEDIATELY NOTIFY THE ENGINEER OF RECORD.
6. THE GRAPHICAL INFORMATION CONTAINED IN ELECTRONIC FILES IS INTENDED AS DRAWING DATA ONLY, IT IS NOT INTENDED TO SERVE AS SURVEY LAYOUT DATA.
7. ALL SITEWORK UTILITIES TO BE INSTALLED BY SITE CONTRACTOR TO A POINT (5) FIVE FEET FROM THE BUILDING STRUCTURE IN ACCORDANCE WITH INDUSTRY STANDARDS UNLESS SPECIFICALLY SHOWN OTHERWISE. SITE CONTRACTOR TO COORDINATE WITH BUILDING TRADES CONTRACTOR TO ENSURE COORDINATION OF UTILITY CONNECTION LOCATIONS AND MATERIAL SPECIFICATIONS. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER OF RECORD.
8. ALL DIMENSIONAL INFORMATION SHOWN HEREON INDICATING BUILDINGS IS BASED UPON FACE OF BUILDING. ALL ROADWAY DIMENSIONS ARE TO INSIDE FACE OF CURBING. ALL SIDEWALK DIMENSIONS ARE TO OUTSIDE FACE OF CURBING.

STORMWATER POLLUTION PREVENTION PLAN (SPPP) WASTE CONTROL COMPONENT GENERAL NOTES

1. CONTRACTOR TO STORE ANY PESTICIDES, FERTILIZERS, FUELS, LUBRICANTS, PETROLEUM PRODUCTS, ANTI-FREEZE, PAINTS AND PAINT THINNERS, CLEANING SOLVENTS AND ACIDS, DETERGENTS, CHEMICAL ADDITIVES, AND CONCRETE CURING COMPOUNDS IN SUITABLE SAFE CONTAINERS IN A DRY AND COVERED AREA. CONTRACTOR TO ADHERE TO PRODUCT MANUFACTURERS' DIRECTION REGARDING APPLICATION USES AND METHODS BEING APPLIED.
2. CONTRACTOR SHALL CONFORM TO THE STATE SOLID WASTE MANAGEMENT ACT, N.J.S.A. 13:1E-1 ET SEQ., AND ITS IMPLEMENTING RULES AT N.J.A.C. 7:26, 7:26A, AND 7:26G; THE NEW JERSEY PESTICIDE CONTROL CODE AT N.J.A.C. 7:30; THE STATE LITTER STATUTE (N.J.S.A. 13:1E-99.3); AND OSHA REQUIREMENTS FOR SANITATION AT 29 C.F.R. 1926 FOR SITE BUILDING WASTE MATERIAL AND RUBBLE AND OTHER CONSTRUCTION SITE WASTES, INCLUDING LITTER AND HAZARDOUS AND SANITARY WASTES. CONSTRUCTION SITES SHALL HAVE ONE OR MORE DESIGNATED WASTE COLLECTION AREAS ONSITE AND AN ADEQUATE NUMBER OF CONTAINERS FOR WASTE. STAGED WASTE CONTAINERS SHALL BE MAINTAINED SO AS TO PREVENT WASTE MATERIALS FROM OVERFLOWING, LEAKING, OR BLOWING OUT OF THE CONTAINER. SPILLS, LEAKS, AND OVERFLOWS, WHICH DO OCCUR, SHALL BE CLEANUP IMMEDIATELY.
3. RESPONSIBILITIES OF PERMITTEE OR OWNER REPRESENTATIVE:
   a. THE PERMITTEE OR CLIENT REPRESENTED SHALL CONDUCT AND DOCUMENT WEEKLY INSPECTIONS REPORTS OF THE AREAS OF INDUSTRIAL ACTIVITY OR SMALL CONSTRUCTION ACTIVITIES TO IDENTIFY AREAS CONTRIBUTING TO THE STORMWATER DISCHARGE AUTHORIZED BY THIS PERMIT AND EVALUATE WHETHER THE REGULATED ACTIVITIES, IDENTIFIED UNDER THE 5G3 CONSTRUCTION ACTIVITY STORMWATER NARRATIVE REQUIREMENTS E.1, IS BEING PROPERLY IMPLEMENTED AND MAINTAINED, OR WHETHER ADDITIONAL MEASURES ARE NEEDED FOR THE REGULATED ACTIVITY.
   b. IN THE EVENT THAT THE INDUSTRIAL ACTIVITIES OR SMALL CONSTRUCTION ACTIVITIES ON-SITE ARE CEASED OR ARE ANTICIPATED TO CEASE FOR A PERIOD OF SIX (6) MONTHS OR GREATER THE PERMITTEE MAY SEEK A SUSPENSION OF THE ROUTINE INSPECTION REQUIREMENT OF THE PERMIT OR REDUCTION IN FREQUENCY TO MONTHLY WITH THE WRITTEN APPROVAL OF THE SOIL CONSERVATION DISTRICT OFFICE OVERSEEING THE PROJECT ON A FORM PROVIDED BY THE DEPARTMENT.
4. CONSTRUCTION SITE WASTES INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
   a. "CONSTRUCTION AND DEMOLITION WASTE," AS DEFINED IN N.J.A.C. 7:26-1.4 AS FOLLOWS: "WASTE BUILDING MATERIAL AND RUBBLE RESULTING FROM CONSTRUCTION, REMODELING, REPAIR, AND DEMOLITION OPERATIONS ON HOUSES, COMMERCIAL BUILDINGS, PAVEMENTS AND OTHER STRUCTURES. THE FOLLOWING ARE EXAMPLES OF MATERIALS THAT MAY BE FOUND IN CONSTRUCTION AND DEMOLITION WASTE: TREATED AND UNTREATED WOOD SCRAP; TREE PARTS, TREE STUMPS AND BRUSH; CONCRETE, ASPHALT, BRICKS, BLOCKS AND OTHER MASONRY; PLASTER AND WALLBOARD; ROOFING MATERIALS; CORRUGATED CARDBOARD AND MISCELLANEOUS PAPER; FERROUS AND NON-FERROUS METAL; NON-ASBESTOS BUILDING INSULATION; PLASTIC SCRAP; DIRT; CARPETS AND PADDING; GLASS (WINDOW AND DOOR); AND OTHER MISCELLANEOUS MATERIALS; BUT SHALL NOT INCLUDE OTHER SOLID WASTE TYPES."
   i. ANY WASTE BUILDING MATERIAL AND RUBBLE RESULTING FROM SUCH OPERATIONS THAT IS HAZARDOUS FOR PURPOSES OF N.J.A.C. 7:26G (THE HAZARDOUS WASTE RULES).
   ii. DISCARDED (INCLUDING SPILLED) PESTICIDES, FERTILIZERS, FUELS, LUBRICANTS, PETROLEUM PRODUCTS, ANTI-FREEZE, PAINTS AND PAINT THINNERS, PAINT CHIPS AND SANDBLASTING GRITS, CLEANING SOLVENTS, ACIDS FOR CLEANING MASONRY SURFACES, DETERGENTS, CHEMICAL ADDITIVES USED FOR SOIL STABILIZATION (E.G., CALCIUM CHLORIDE), AND CONCRETE CURING COMPOUNDS.
   iii. OTHER "LITTER," AS DEFINED AT N.J.S.A. 13:1E-215.D AS FOLLOWS: "ANY USED OR UNCONSUMED SUBSTANCE OR WASTE MATERIAL WHICH HAS BEEN DISCARDED WHETHER MADE OF ALUMINUM, GLASS, PLASTIC, RUBBER, PAPER, OR OTHER NATURAL OR SYNTHETIC MATERIAL, OR ANY COMBINATION THEREOF, INCLUDING, BUT NOT LIMITED TO, ANY BOTTLE, JAR OR CAN, OR ANY TOP, CAP OR DETACHABLE TAB OF ANY BOTTLE, JAR OR CAN, ANY UNLIGHTED CIGARETTE, CIGAR, MATCH OR ANY FLAMING OR GLOWING MATERIAL OR ANY GARBAGE, TRASH, REFUSE, DEBRIS, RUBBISH, GRASS CLIPPINGS OR OTHER LAWN OR GARDEN WASTE, NEWSPAPERS, MAGAZINES, GLASS, METAL, PLASTIC OR PAPER CONTAINERS OR OTHER PACKAGING OR CONSTRUCTION MATERIAL, BUT DOES NOT INCLUDE THE WASTE OF THE PRIMARY PROCESSES OF MINING OR OTHER EXTRACTION PROCESSES, LOGGING, SAWMILLING, FARMING OR MANUFACTURING."
   iv. SANITARY SEWAGE AND SEPTAGE.
   v. CONTAMINATED SOILS ENCOUNTERED OR DISCOVERED DURING EARTHMOVING ACTIVITIES OR DURING THE CLEANUP OF A LEAK OR DISCHARGE OF A HAZARDOUS SUBSTANCE.
   c. SANITARY SEWAGE/SEPTAGE DISPOSAL – DISCHARGES OF RAW SANITARY SEWAGE OR SEPTAGE ONSITE ARE STRICTLY PROHIBITED. ADEQUATE FACILITIES WITH PROPER DISPOSAL SHALL BE PROVIDED AND MAINTAINED ONSITE FOR ALL WORKERS AND OTHER SANITARY NEEDS.
5. SPILLS; DISCHARGES OF HAZARDOUS SUBSTANCES; FEDERALLY REPORTABLE RELEASES.
   a. SPILL KITS SHALL BE AVAILABLE ONSITE FOR ANY MATERIALS THAT ARE LISTED IN 4.a.ii. ABOVE AND USED OR APPLIED ONSITE. ALL SPILLS OF SUCH MATERIAL SHALL BE CONTAINED AND CLEANED UP IMMEDIATELY. CLEANED UP MATERIALS SHALL BE PROPERLY DISPOSED OF.
   b. DISCHARGES OF HAZARDOUS SUBSTANCES (AS DEFINED IN N.J.A.C. 7:1E-1.6) IN CONSTRUCTION SITE WASTES ARE SUBJECT TO THE PROVISIONS OF THE SPILL COMPENSATION AND CONTROL ACT, N.J.S.A. 58:10-23.11 ET SEQ., AND OF DEPARTMENT RULES FOR DISCHARGES OF PETROLEUM AND OTHER HAZARDOUS SUBSTANCES AT N.J.A.C. 7:1E. NO DISCHARGE OF HAZARDOUS SUBSTANCES RESULTING FROM AN ONSITE SPILL SHALL BE DEEMED TO BE "PURSUANT TO AND IN COMPLIANCE WITH [THIS] PERMIT" WITHIN THE MEANING OF THE SPILL COMPENSATION AND CONTROL ACT AT N.J.S.A. 58:10-23.11C.
   c. RELEASES IN EXCESS OF REPORTABLE QUANTITIES (RQ) ESTABLISHED UNDER 40 C.F.R. 110, 117, AND 302 THAT OCCUR WITHIN A 24-HR PERIOD MUST BE REPORTED TO THE NATIONAL RESPONSE CENTER (800 424-8802).

STORM SEWER NOTES

1. ALL ON-SITE STORM SEWER PIPING SHALL BE ADS HIGH DENSITY POLYETHYLENE PIPE (HDPE) OR APPROVED EQUAL UNLESS NOTED OTHERWISE.
2. ALL STORM SEWER CROSSINGS WITH 18 INCHES OR LESS OF CLEARANCE TO THE SANITARY SEWER SYSTEM SHALL HAVE A CONCRETE CRADLE ON THE UPPER PIPE AND CONCRETE ENCASEMENT ON THE LOWER PIPE AS PER THE PIPE CROSSING DETAIL.
3. BUILDING ROOF DRAIN SYSTEMS SHALL CONNECT TO SITE STORM SEWER SYSTEM UNLESS NOTED OTHERWISE.
4. PROVIDE BICYCLE SAFE GRATES ON ALL STORM SEWER INLETS AND ADA COMPLIANT GRATES ON ALL INLETS WITHIN PEDESTRIAN WALKS
5. ALL ONSITE STORMWATER FACILITIES SHALL BE MAINTAINED BY THE PROPERTY OWNER IN ACCORDANCE WITH NJDEP STANDARD MAINTENANCE REQUIREMENTS.
6. THE MINIMUM DEPTH OF COVER SHALL BE 2'-0" FOR ALL HDPE STORM SEWER PIPES OR PER MANUFACTURERS MINIMUM RECOMMENDED DEPTHS FOR HS-20 LOADING.
7. UNLESS OTHERWISE NOTED, ALL STORM SEWER STRUCTURES SHALL BE PRECAST CONCRETE WITH A MINIMUM H-25 LOAD RATING. ALL STORM SEWER FRAMES, INLET GRATES, AND MANHOLE COVERS SHALL BE UNPAINTED AND UNCOATED HEAVY DUTY H-20 LOADING CAST IRON BY CAMPBELL FOUNDRY OR APPROVED EQUAL.
8. UNLESS OTHERWISE NOTED OR INFERRED BY INVERT ELEVATIONS, PIPE CROWN ELEVATIONS SHALL BE MATCHED IN ALL MANHOLES AND INLETS.

BARRIER FREE ACCESS NOTES

1. CONTRACTORS SHALL EXERCISE APPROPRIATE CARE AND PRECISION IN THE CONSTRUCTION OF PEDESTRIAN ACCESSIBLE ROUTES FROM SITE ARRIVAL POINTS TO ACCESSIBLE BUILDING ENTRANCES AND FACILITIES. FEDERAL LAWS, AS WELL AS STATE/LOCAL BUILDING CODES , REQUIRE MANDATORY COMPLIANCE WITH ACCESSIBILITY DESIGN STANDARDS FOR NEW CONSTRUCTION AND EXISTING FACILITIES (ALTERED OR REMODELED) FOR INDIVIDUALS WITH DISABILITIES. TYPICAL SITE CONSTRUCTION DETAILS OF ACCESSIBLE ROUTES INCLUDE, BUT ARE NOT LIMITED TO, PARKING, SIDEWALKS, RAMPS, RAILINGS, ETC. THESE COMPONENTS (AS CONSTRUCTED) MUST COMPLY WITH THE CURRENT EDITION OF THE ADA STANDARDS FOR ACCESSIBLE DESIGN, THE NEW JERSEY UNIFORM CONSTRUCTION CODE, BARRIER FREE SUBCODE N.J.A.C. 5:23-7, AND OTHERS. SEVERAL OF THE SPECIFIC ACCESSIBLE ROUTE CONSTRUCTION STANDARDS FOR TRAVEL FROM PARKING SPACES, PUBLIC TRANSPORTATION, PEDESTRIAN ACCESS AND INTER-BUILDING ACCESS, TO POINTS OF ACCESSIBLE BUILDING ENTRANCE/EGRESS, INCLUDE, BUT ARE NOT LIMITED TO:
   a. PARKING SPACES AND PARKING AISLES – SLOPE SHALL NOT EXCEED 1:50 (NOMINALLY 2.0%) IN ANY DIRECTION.
   b. CURB RAMPS – SLOPE SHALL NOT EXCEED 1:12 (8.3%) FOR A MAXIMUM OF SIX (6) FEET.
   c. LANDINGS – SHALL BE PROVIDED AT EACH END OF RAMPS, POSITIVE DRAINAGE SHALL BE PROVIDED, AND CROSS SLOPE SHALL NOT EXCEED 1:50 (NOMINALLY 2.0%)
   d. PATH OF TRAVEL ALONG ACCESSIBLE ROUTE – SHALL PROVIDE A 36 INCH OR GREATER UNOBSTRUCTED WIDTH OF TRAVEL, (CAR OVERHANGS CANNOT REDUCE THIS MINIMUM WIDTH), THE SLOPE SHALL BE NO GREATER THAN 1:20 (5.0%) IN THE DIRECTION OF TRAVEL, AND SHALL NOT EXCEED 1:50 (NOMINALLY 2.0%) IN CROSS SLOPE. WHERE PATH OF TRAVEL WILL BE GREATER THAN 1:20 (5.0%), AN ADA RAMP WITH A MAXIMUM SLOPE OF 1:12 (8.3%), FOR A MAXIMUM DISTANCE OF 30 FEET, SHALL BE PROVIDED. THE RAMP SHALL HAVE ADA HAND RAILS AND "LEVEL" LANDINGS ON EACH END THAT ARE CROSS SLOPED NO MORE THAN 1:50 (NOMINALLY 2.0%) FOR POSITIVE DRAINAGE.
   e. DOORWAYS – SHALL HAVE A "LEVEL" LANDING AREA ON THE EXTERIOR SIDE OF THE DOOR THAT IS SLOPED NO MORE THAN 1:50 (NOMINALLY 2.0%) FOR POSITIVE DRAINAGE. THIS LANDING AREA SHALL BE NO LESS THAN 60 INCHES (5 FEET) LONG, EXCEPT WHERE OTHERWISE PERMITTED BY ADA STANDARDS FOR ALTERNATIVE DOORWAY OPENING CONDITIONS (SEE ICC/ANSI A117.1-2003 AND OTHER REFERENCES INCORPORATED BY CODE).
2. IT IS RECOMMENDED THAT PRIOR TO CONSTRUCTION OF SITE IMPROVEMENTS RELATED TO PEDESTRIAN ACCESSIBILITY, THAT THE CONTRACTOR REVIEW SPECIFIC CONSTRUCTION DETAILS WITH THE LOCAL BUILDING CODE OFFICIAL, OWNER'S CONSTRUCTION MANAGER, AND ENGINEER PRIOR TO COMMENCING WORK TO VERIFY CODE COMPLIANCE WITH CURRENT BUILDING CODE STANDARDS.

SHOP DRAWING SUBMITTALS

1. THE CONTRACTOR SHALL SUBMIT ALL SHOP DRAWINGS FOR ALL COMPONENTS OF A UNIT OF CONSTRUCTION (EG. PRECAST STRUCTURE WITH FRAME AND CASTING, PIPE MATERIAL, JOINT TYPE, AND LADDER RUNGS).
2. SUBSTITUTIONS OF PROPRIETARY MATERIAL AND/OR PRODUCT SPECIFICATIONS THAT NOTE "OR EQUAL" MUST BE APPROVED BY THE DESIGN ENGINEER. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DEMONSTRATE TO THE SATISFACTION OF THE DESIGN ENGINEER THAT THE SUBSTITUTION IS EQUAL AND ACCEPTABLE.
3. SHOP DRAWINGS AND OTHER SUBMITTALS SHALL BE PROVIDED A MINIMUM OF 12 DAYS IN ADVANCE OF CONTRACTOR'S NEED.
4. INVERT ELEVATIONS AS INDICATED ON SHOP DRAWINGS WILL BE VERIFIED. STRUCTURE OPENINGS WILL NOT BE REVIEWED AND ARE THE RESPONSIBILITY OF THE CONTRACTOR.

UTILITY INSTALLATION NOTES

1. ATTENTION OF THE CONTRACTOR IS DIRECTED TO THE FACT THAT THE LOCATION OF KNOWN UTILITY STRUCTURES AND FACILITIES THAT MAY BE ENCOUNTERED WITHIN AND ADJACENT TO THE LIMITS OF WORK AS SHOWN ON THE PLANS IS APPROXIMATE. THE ACCURACY AND COMPLETENESS OF THIS INFORMATION IS NOT GUARANTEED BY THE ENGINEER. THE CONTRACTOR SHALL VERIFY IN THE FIELD ALL THE FACTS CONCERNING THE UTILITY INFORMATION, LOCATIONS AND OTHER CONSTRUCTION OBSTACLES PRIOR TO CONSTRUCTION. FURTHER, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING PRIOR TO CONSTRUCTION OF ANY DISCREPANCIES WHICH MAY AFFECT PROJECT DESIGN AND/OR SCOPE. PS&S ASSUMES NO LIABILITY FOR ANY OF THE EXISTING UTILITY INFORMATION SHOWN HEREIN, EXISTING UTILITY LINE LOCATIONS ARE SHOWN FOR SCHEMATIC PURPOSES ONLY AND MAY NOT REPRESENT ALL EXISTING UTILITIES.
2. EXISTING STREET SURFACES AND OTHER SURFACES DISTURBED BY THE CONSTRUCTION OF FACILITIES FOR THIS PROJECT SHALL BE RESTORED BY THE CONTRACTOR IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ELIZABETH.
3. ADDITIONAL EASEMENTS NOT SHOWN ON THE PLANS MAY BE NECESSARY FOR THE PLACEMENT OF UTILITY STRUCTURES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ANY REQUIRED EASEMENT. PAULUS, SOKOLOWSKI, AND SARTOR ASSUMES NO LIABILITY FOR ANY OF THE EASEMENT INFORMATION SHOWN HEREIN. EASEMENTS SHOWN ON THESE PLANS ARE FOR SCHEMATIC PURPOSES AND MAY NOT REFLECT ALL EASEMENTS. ALL EASEMENT INFORMATION SHALL BE VERIFIED BY THE CONTRACTOR AND ALL EASEMENT LOCATIONS INDICATED IN THE FIELD BY SURVEY.
4. ALL EXISTING UTILITY MANHOLE RIMS, VALVE BOXES, ETC. TO BE RESET IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE UTILITY COMPANY OR AS PER THE CITY OF ELIZABETH REQUIREMENTS.
5. TRENCH DETAILS ARE INTENDED TO PROVIDE INFORMATION REGARDING BACKFILLING MATERIALS AND GENERAL MATERIAL DEPTHS AND PAYMENT LIMITS ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND SHALL PROVIDE APPROPRIATE SAFETY MEASURES, SHEETING, AND BRACING AS MAY BE REQUIRED DUE TO FIELD CONDITIONS. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OSHA STANDARDS AND DETAILS FOR TRENCH EXCAVATION. THE DESIGN ENGINEER ASSUMES NO RESPONSIBILITY OR LIABILITY FOR FIELD CONDITIONS, TRENCHING OR BACKFILLING OPERATIONS DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING AND PRECLUDING ANY PONDING OF WATER IN ALL AREAS, EXCEPT AS SPECIFIED ON THE SOIL EROSION AND SEDIMENT CONTROL PERMIT DOCUMENTS.
7. ALL NEW UTILITIES SHALL BE INSTALLED UNDERGROUND, EXCEPT WHERE OTHERWISE NOTED.
8. UTILITIES LOCATED WITHIN ROADWAYS SHALL BE CONSTRUCTED PRIOR TO THE CONSTRUCTION OF THE ROADWAYS.
9. THE CONTRACTOR SHALL REQUEST UTILITY MARKOUTS AT LEAST SEVENTY-TWO (72) HOURS PRIOR TO ANY SITE DISTURBANCE. CONTRACTOR MUST NOTIFY "NEW JERSEY ONE-CALL" (800-272-1000) PRIOR TO ANY EXCAVATION OR GRADING ACTIVITY.
10. CONTRACTOR SHALL MAINTAIN AND PROTECT ALL EXISTING SURFACE AND SUBSURFACE UTILITIES DURING CONSTRUCTION OPERATION ACTIVITIES.

LEGEND

Symbol	Description
	PROPERTY LINE
20	EXISTING CONTOUR
20	PROPOSED CONTOUR
× 20.1	EXISTING SPOT ELEVATION
× 20.10	PROPOSED SPOT ELEVATION
SS	PROPOSED SANITARY SEWER
	PROPOSED STORM SEWER
D	EXISTING STORM MANHOLE
	EXISTING SANITARY MANHOLE
	PROPOSED STORM/SANITARY MANHOLE
SS	EXISTING SANITARY SEWER
	EXISTING STORM SEWER
	PROPOSED CURB INLET
	PROPOSED AREA INLET
	PROPOSED TRENCH DRAIN
	EXISTING CURB INLET
	CONCRETE HEAD WALL OR FLARED END SECTION
	PROPOSED RETAINING WALL
W	PROPOSED WATER LINE
G	PROPOSED GAS LINE
E	PROPOSED OVERHEAD ELECTRIC
CC	EXISTING UNDERGROUND CABLE
E/T	EXISTING UNDERGROUND ELECTRIC/TELEPHONE
G	EXISTING GAS LINE
W	EXISTING WATER LINE
FM	EXISTING SANITARY FORCE MAIN
UGE	EXISTING UNDERGROUND ELECTRIC
E	EXISTING OVERHEAD ELECTRIC
TCD	PROPOSED TELEPHONE, CABLE AND DATA CONDUIT
FM	PROPOSED FORCE MAIN
W	PROPOSED WATER LINE
FW	PROPOSED FIRE WATER LINE
CC	PROPOSED CABLE LINE
	EXISTING UTILITY POLE
WV	PROPOSED WATER VALVE
	EXISTING WATER VALVE
	PROPOSED THRUST BLOCK
	EXISTING FIRE HYDRANT
	PROPOSED FIRE HYDRANT
	PROPOSED CURB
	DEPRESSED CURB
	CONCRETE SIDEWALK
	HANDICAP CURB RAMP
10	PARKING SPACE COUNT
♿	HANDICAP PARKING SPACE
	PROPOSED CHAIN LINK FENCE
	PROPOSED GUIDE RAIL
SHD	STATE HIGHWAY DEPT. CONTROL BOXES
	PEDESTRIAN SIGNAL & BOXES
	PROPOSED SIGN
	EXISTING SIGN
	PROPOSED LIGHT FIXTURE
	EXISTING LIGHT POLE
	EXISTING TREE
	CATCH BASIN SEDIMENT FILTER
	TREE PROTECTION
	SILT FENCE
	TREE LINE

Abbreviation	Meaning
AFG	ABOVE FINISHED GRADE
BC	BOTTOM OF CURB
BW	BOTTOM OF WALL
CO	CLEANOUT
DC	DEPRESSED CURB
DI	DRAINAGE INLET
DIP	DUCTILE IRON PIPE
FC	FLUSH CURB
FF	FINISHED FLOOR
GR	GRATE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HP	HIGH POINT
HW	HEADWALL
INV	INVERT
LF	LINEAR FOOT
LP	LOW POINT
MBW	MODULAR BLOCK WALL
MH	STORM SEWER MANHOLE
NP	NYLOPLAST DRAINAGE BASIN
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE PIPE
R=	RADIUS
RCP	REINFORCED CONCRETE PIPE
SF	SQUARE FEET
TR	TOP OF RAMP
BR	BOTTOM OF RAMP
TC	TOP OF CURB
TW	TOP OF WALL
TYP	TYPICAL
VIF	VERIFY IN FIELD

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

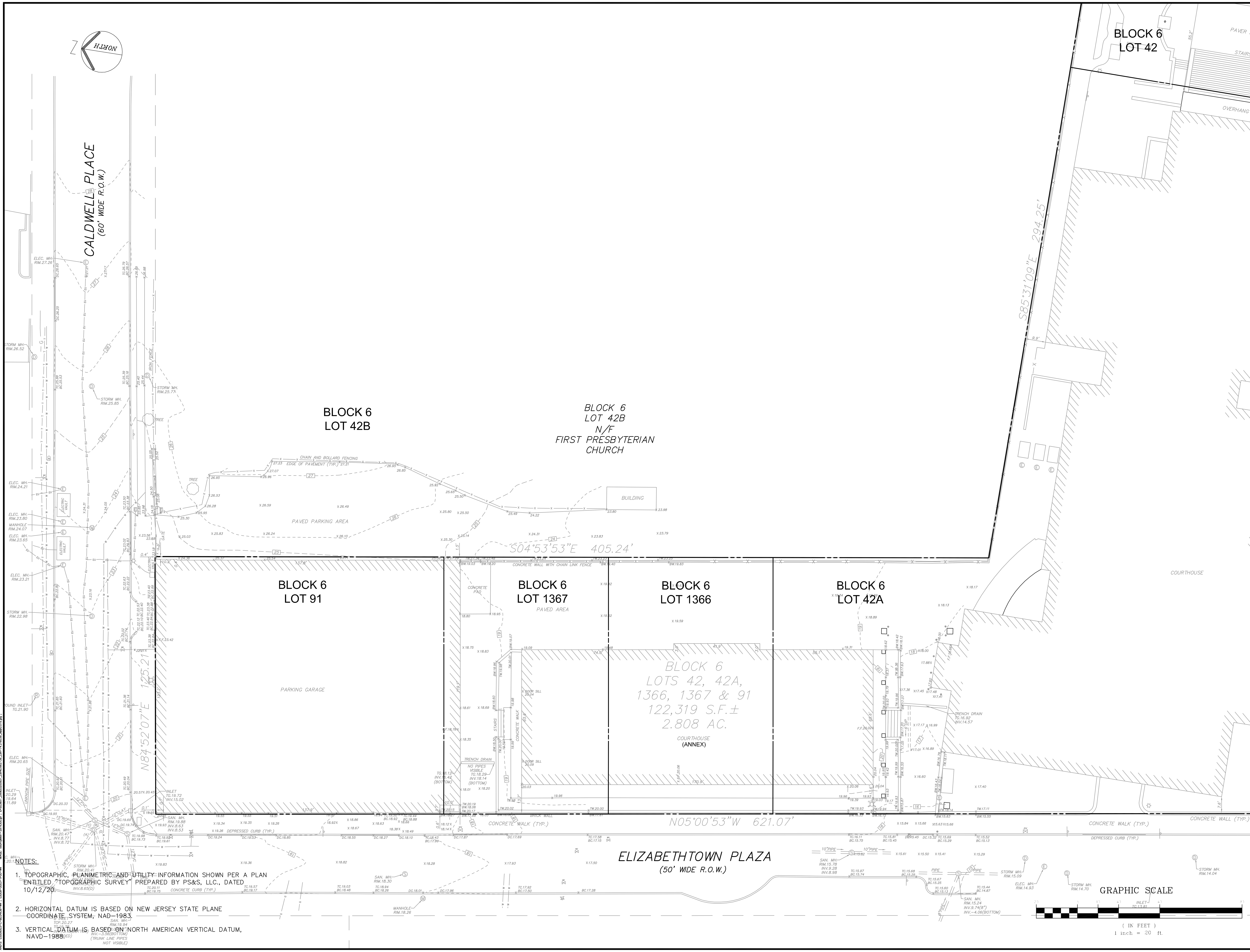
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

GENERAL NOTES AND LEGEND

PROJECT NO.: 03009-003	DRAWN BY: AM
SCALE: N.T.S.	CHECKED BY: PAR
DATE: 11-30-2020	SHEET OF
SHEET NO. C-2	



NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD-1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD-1988.

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

EXISTING CONDITIONS SITE PLAN

PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF

SHEET NO.
C-3

DEMOLITION NOTES

1. PRIOR TO THE START OF GRADING AND CLEARING OPERATIONS, THE CONTRACTOR SHALL INSTALL TEMPORARY CONSTRUCTION FENCING ALONG THE LIMITS OF DISTURBANCE LINE TO DELINEATE THE PROTECTED AREAS FROM DAMAGE. FENCING TO BE COORDINATED WITH OWNER.
2. FEDERAL AND STATE LAWS MANDATE REMOVAL AND DISPOSAL OF CERTAIN HAZARDOUS MATERIALS PRIOR TO DEMOLITION OF A STRUCTURE. AS SUCH THE CONTRACTOR MUST REVIEW AND ADHERE TO THE REQUIREMENTS CONTAINED IN THE HAZARDOUS MATERIAL BUILDING INVESTIGATION REPORT AND ABATEMENT PLAN PREPARED BY OTHERS PRIOR TO ANY BUILDING DEMOLITION ACTIVITIES. TESTING AND DISPOSAL OF ALL BUILDING MATERIALS TO BE DEMOLISHED AND REMOVED SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE APPLICABLE NJDEP REGULATIONS AND THE HAZARDOUS MATERIALS BUILDING MATERIALS INVESTIGATION REPORT AND ABATEMENT PLAN. THE HAZARDOUS MATERIAL BUILDING INVESTIGATION REPORT AND ABATEMENT PLAN WILL IDENTIFY THE LOCATIONS AND QUANTITIES OF ANY HAZARDOUS MATERIALS THAT WILL REQUIRE REMOVAL PRIOR TO BUILDING DEMOLITION. THE DEMOLITION CONTRACTOR WILL BE RESPONSIBLE FOR RETAINING THE SERVICES OF APPROPRIATELY LICENSED SUBCONTRACTOR(S) AND/OR CONSULTANTS TO PERFORM THE REQUIRED REMOVALS, INTERIOR AIR MONITORING AND POST-REMOVAL TESTING OF HAZARDOUS BUILDING MATERIALS PRIOR TO BUILDING DEMOLITION.
3. ALL EXISTING STRUCTURES AND UTILITIES NOT INDICATED TO BE REMOVED SHALL BE LOCATED, IDENTIFIED AND PROTECTED FROM DAMAGE THROUGHOUT THE CONSTRUCTION PERIOD. ALL STRUCTURES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE AND TO THE SATISFACTION OF THE OWNER. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES AS ACCEPTABLE TO THE OWNER.
4. ALL TEMPORARY STORAGE EQUIPMENT/DUMPSTERS PROVIDED BY THE CONTRACTOR SHALL BE MAINTAINED PROPERLY AND DISPOSED OF BY THE CONTRACTOR UPON COMPLETION OF THE WORK. LOCATIONS TO BE A MINIMUM OF 15 FEET FROM BUILDINGS AND AS APPROVED BY THE OWNER.
5. ANY UTILITIES NOT SHOWN ON THE PLANS BUT UNCOVERED IN THE FIELD SHALL BE VERIFIED FOR ITS STATUS (ACTIVE OR ABANDONED). THE UTILITIES CONFIRMED ABANDONED SHALL BE COMPLETELY REMOVED (WITHIN THE LIMITS OF THE WORK) AND DISPOSED OF OFF SITE AS PART OF THIS WORK. ANY DISRUPTION TO ACTIVE UTILITIES MUST BE REPAIRED BY THE CONTRACTOR WITHIN 24 HOURS OF THE DISRUPTION AT THE CONTRACTORS EXPENSE AND TO THE SATISFACTION OF THE OWNER.
6. ALL MATERIAL REMOVED SHALL BE SEGREGATED BY MATERIAL TYPE AND DISPOSED OF PER LOCAL, NJDEP, USEPA, AND OTHER APPLICABLE REGULATORY AUTHORITY REGULATIONS.
7. IF HAZARDOUS MATERIALS ARE ENCOUNTERED DURING DEMOLITION, THE CONTRACTOR SHALL IMMEDIATELY STOP WORK AND REPORT SUCH FINDINGS TO THE OWNER'S REPRESENTATIVE WHO WILL ARRANGE FOR TESTING AND BE RESPONSIBLE FOR THE PERFORMANCE OF ANY SERVICES IN CONNECTION WITH IDENTIFYING OR THE REMOVAL OF SUCH MATERIALS.
8. DEWATERING: PREVENT SURFACE WATER AND SUBSURFACE OR GROUND WATER FROM FLOWING INTO EXCAVATIONS AND FROM FLOODING PROJECT SITE AND SURROUNDING AREAS. CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING MEANS AND METHODS NECESSARY TO DEWATER THE PROJECT SITE AND FACILITATE COMPACTION OF BACKFILL AS REQUIRED.
9. DO NOT ALLOW WATER TO ACCUMULATE IN EXCAVATIONS. REMOVE WATER TO PREVENT SOFTENING OF BOTTOMS AND SOIL CHANGES DETRIMENTAL TO STABILITY OF SUBGRADE. PROVIDE AND MAINTAIN PUMPS, WELL POINTS, SUMPS, SUCTION AND DISCHARGE LINES, AND OTHER DEWATERING SYSTEM COMPONENTS NECESSARY TO CONVEY WATER AWAY FROM EXCAVATIONS. DEWATERING SYSTEMS SHALL BE INSTALLED AND OPERATED SUCH THAT UPWARD FLOW OF GROUNDWATER IS PREVENTED AND THE BEARING STRENGTH OF THE SUBGRADE SOILS IS NOT AFFECTED.
10. CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY COVER (CRUSHED STONE, STEEL PLATES OR OTHER MEANS) OVER ALL ACTIVE UNDERGROUND UTILITY PIPING DURING CONSTRUCTION IN ORDER TO PROTECT PIPING WHICH MAY NOT HAVE ENOUGH COVER (BELOW FINISHED GRADE) TO WITHSTAND CONSTRUCTION EQUIPMENT LOAD.
11. BEGINNING OF DEMOLITION/CONSTRUCTION SHALL INDICATE THAT THE CONTRACTOR ACCEPTS THE EXISTING CONDITIONS.
12. TEMPORARY STAGING AREA FOR THE PROPOSED WORK SHALL BE AS DIRECTED BY THE OWNER.
13. TRENCH EXCAVATION, IF REQUIRED FOR UTILITIES IN PAVED AREAS, SHALL BE BACK FILLED WITH COMPACTED DENSE GRADED AGGREGATE CONFORMING TO NJDOT SPECIFICATION SECTION 901 UP TO PAVEMENT SUBBASE.
14. BITUMINOUS PAVEMENT CONSTRUCTION/REPAIR, IF REQUIRED, SHALL BE IN ACCORDANCE WITH NJDOT AND PROJECT SPECIFICATIONS/DETAILS.
15. THE CONTRACTOR SHALL NOTIFY THE OWNERS REPRESENTATIVE, MUNICIPAL ENGINEER, AND "SUPER SNOOPER" (1-800-272-1000) AT LEAST 72 HOURS PRIOR TO ANY SITE DISTURBANCE.
16. CONTRACTOR MUST PERFORM FIRST 6-FEET DEEP SOFT DIG TRENCH ALONG PERIMETER OF PROPOSED EXCAVATION LIMIT AND PROPERLY CUT OFF OR REROUTE ACTIVE UTILITY TO AVOID ANY UNDERGROUND UTILITY DAMAGE.
17. CONTRACTOR TO PROVIDE TEMPORARY STORM DRAINAGE MEASURES UNTIL CONSTRUCTION COMPLETION.
18. THE CONTRACTOR SHALL TAKE EXTREME PRECAUTION DURING THE DEMOLITION IN PROXIMITY OF EXISTING UTILITIES TO BE PROTECTED. PROPOSED SHEETING AND SHORING SYSTEM, IF NECESSARY, SHALL BE DESIGNED, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY AND SHALL BE SUBMITTED TO OWNER FOR REVIEW.
19. UNLESS INDICATED OTHERWISE, EXISTING BUILDING WALLS, FOOTINGS, SLABS, COLUMNS, WALLS, BASEMENT, RAMPS AND STEPS TO BE ENTIRELY DEMOLISHED AND REMOVED.
20. DURING DEMOLITION OR EXCAVATION, MINIMUM AREA SHALL BE DISTURBED BEYOND THE LIMIT OF DISTURBANCE, AS INDICATED IN THE DRAWING. VERTICAL WALLS OF EXCAVATION TO CONFORM TO O.S.H.A. REQUIREMENTS.
21. THE CONTRACTOR SHALL ENSURE THAT ANY AREA DISTURBED DURING REGRADING OR DEMOLITION ACTIVITY OR ANY BACKFILL THAT MAY BE REQUIRED TO ACHIEVE FINAL GRADE SHALL BE PLACED IN A CONTROLLED MANNER AS A COMPACTED CLEAN FILL. ALL EXCAVATED/DISTURBED AREAS SHALL BE BACKFILLED WITH CLEAN FILL, AS DESCRIBED IN "NOTES ON EARTHWORK", NOTE NO. 9. UNLESS INDICATED OTHERWISE, ANY PAVED AREA DISTURBED FOR THE PURPOSES OF UTILITY CUT AND CAP WITHIN THE CITY R.O.W. SHALL BE RESTORED TO MATCH THE EXISTING CONDITION IN ACCORDANCE WITH THE CITY REQUIREMENTS.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING, DUST CONTROL AND ASSOCIATED MONITORING THROUGHOUT THE BUILDING DEMOLITION AND POST DEMOLITION SITE IMPROVEMENT PROCESS IN ACCORDANCE WITH REQUIREMENTS OF CITY OF ELIZABETH AND OTHER APPLICABLE REGULATORY AUTHORITIES.
23. ALL EXISTING STREET SIGNAGE SHALL BE MAINTAINED DURING DEMOLITION AND REPLACED AS REQUIRED BY CITY.
24. CONTRACTOR SHALL COORDINATE SOILS/EARTHWORK MANAGEMENT PLANS (EXCAVATION AND CLEAN FILL) WITH OWNER ON-SITE ASSIGNED REPRESENTATIVE PRIOR TO DEMOLITION/CONSTRUCTION.
25. POST DEMOLITION, DISTURBED AREAS WITHIN AND ADJACENT TO THE EXISTING BUILDING FOOTPRINT SHALL BE BACKFILLED TO THE PROPOSED SUBGRADE ELEVATION (6" BELOW PROPOSED FINISHED GRADE) IN ACCORDANCE WITH THE "NOTES ON EARTHWORK", USING CLEAN FILL MATERIAL (SEE "NOTES ON EARTHWORK, NOTE NO. 9). SURFACE COVER SHALL BE INSTALLED IN ACCORDANCE WITH THE PROPOSED FINISHED GRADE.
26. THE SITE DEMOLITION PLAN IS IN GENERAL INTENDED TO INDICATE UTILITIES DISCONNECT AND/OR REMOVAL, EXISTING BUILDINGS AND SITE DEMOLITION, AND POST DEMOLITION SITE CONDITION. PS&S ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE MEANS AND METHODS OF DEMOLITION, DEWATERING, IMPACT OF ANY EXISTING HAZARDOUS MATERIALS ON DEMOLITION ACTIVITIES AND MEASURES TO ABATE, CONTROL OR CONTAIN THEM AND TO PREVENT THE EXPOSURE OF THE SAME IN ACCORDANCE WITH APPLICABLE REGULATORY AUTHORITY REQUIREMENTS. IT IS ASSUMED THAT CONTRACTOR SHALL COORDINATE WITH THE CITY OF ELIZBETH AND OTHER APPLICABLE REGULATORY AUTHORITIES AS NECESSARY AND SHALL BE RESPONSIBLE FOR ALL DEMOLITION ACTIVITIES.
27. THE CONTRACTOR SHALL INSTALL TEMPORARY FENCING ALONG THE PERIMETER OF THE ACTIVE WORK AREA ZONES. FENCING SHALL HAVE LOCKABLE GATES FOR ENTRY OF VEHICLES AT THE STABILIZED CONSTRUCTION ENTRANCE. LOCATION OF FENCING SHALL BE COORDINATED WITH OWNER.
28. CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY WORK BEYOND LIMIT OF DISTURBANCE LINE PRIOR TO THE START OF CONSTRUCTION.

ADDITIONAL DEMOLITION NOTES

1. ALL CONSTRUCTION SHOWN HEREIN SHALL CONFORM TO MUNICIPAL AND/OR COUNTY STANDARDS, CONSTRUCTION DETAILS, AND SPECIFICATIONS APPLICABLE AS WELL AS THE NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, UNLESS SPECIFICALLY NOTED OTHERWISE. IN CASE OF CONFLICT, THE MORE RESTRICTIVE SHALL GOVERN. CONTRACTOR SHALL NOTIFY DESIGN ENGINEER OF ALL CONFLICTS.
2. THE CONTRACTOR SHALL SUBMIT A DETAILED SCHEDULE SHOWING STARTING AND COMPLETION DATES FOR ALL ASPECTS OF THE WORK. THE SCHEDULE SHALL ADHERE TO ALL REQUIREMENTS OF CONTRACT DOCUMENTS.
3. ALL WORK AND MATERIALS SHALL MEET THE APPLICABLE REQUIREMENTS OF ALL LOCAL CODES AND STANDARDS HAVING JURISDICTION, AND THE FOLLOWING:
   NEC – NATIONAL ELECTRICAL CODE
   OSHA – OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS
   BOCA – BUILDING OFFICIALS AND CODE ADMINISTRATORS
   IEEE – INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
   ANSI – AMERICAN NATIONAL STANDARDS INSTITUTE
   NJDOT – NEW JERSEY DEPARTMENT OF TRANSPORTATION
   MUTCD – MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
   NJDEP – NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
   IBC – INDUSTRIALIZED BUILDINGS COMMISSION
4. BEFORE SUBMITTING PROPOSALS, EACH BIDDER SHALL VISIT THE SITE OF THE WORK TO BECOME ACQUAINTED WITH EXISTING CONDITIONS AND LIMITATIONS. FAILURE TO DO SO SHALL IN NO MANNER RELIEVE THE CONTRACTOR FROM THE OBLIGATIONS OF THE DRAWINGS, SPECIFICATIONS AND/OR CONTRACT, AS STATED OR IMPLIED.
5. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT AND SERVICES AND PERFORM ALL OPERATIONS REQUIRED FOR THE WORK AS INDICATED ON THE DRAWINGS, AND THE PROJECT BID SPECIFICATIONS.
6. ALL EXISTING STRUCTURES AND UTILITIES NOT INDICATED TO BE REMOVED SHALL BE LOCATED, IDENTIFIED, SUPPORTED AND PROTECTED FROM DAMAGE THROUGHOUT THE CONSTRUCTION PERIOD. ALL STRUCTURES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE AND TO THE SATISFACTION OF THE HCIA.
7. FOLLOWING NOTIFICATION TO UNION COUNTY, THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO OBTAIN THE NECESSARY PERMITS FROM THE OFFICE OF THE MUNICIPAL ENGINEER PRIOR TO THE START OF WORK.
8. CONTRACTOR WILL PROVIDE A HEALTH AND SAFETY PLAN TO THE UNION COUNTY WITHIN TWO (2) WEEKS OF CONTRACT AWARD AND PRIOR TO COMMENCEMENT OF WORK.
9. REGULAR WORK HOURS FOR THE PROJECT ARE 7:00 A.M. TO 4:00 P.M, MONDAY THROUGH FRIDAY.
10. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES, INLETS AND OTHER UTILITY STRUCTURES ARE APPROXIMATE BASED ON EXISTING RECORD DOCUMENTS PROVIDED AND SUBJECT TO FIELD VERIFICATION BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK. CAUTION SHALL BE OBSERVED AT ALL TIMES AS UNDERGROUND AND OVERHEAD LINES MAY EXIST WHICH ARE NOT SHOWN HEREIN. REPORT ANY DISCREPANCIES TO THE OWNER, PRIOR TO COMMENCEMENT OF WORK
11. THE CONTRACTOR SHALL CONTACT THE OWNER PRIOR TO THE START OF CONSTRUCTION TO REVIEW THE CONTRACTORS PROJECT SCHEDULE AND TO COORDINATE ALL SITE ACTIVITIES.
12. PRIOR TO THE COMMENCEMENT OF ANY SITE WORK ACTIVITIES, THE CONTRACTOR SHALL DETERMINE THE ACTUAL PHYSICAL LOCATION AND DEPTH OF ALL EXISTING UTILITIES WITHIN THE PROPOSED PROJECT AREA.
13. UNLESS OTHERWISE NOTED, ALL EXISTING PAVED AND UNPAVED/LANDSCAPED OR GRASSED SURFACE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO MATCH EXISTING CONDITIONS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MUNICIPAL ENGINEER.
14. **DEMOLITION WORK PLAN**: CONTRACTOR SHALL PREPARE AND SUBMIT A DEMOLITION WORK PLAN THAT PROVIDES A DETAILED SUMMARY OF THE CONTRACTOR'S PROPOSED MEANS AND METHODS, AS WELL AS OTHER COMPONENTS AS DESCRIBED HEREIN.
15. **PERMITS:** CONTRACTOR SHALL WORK WITH THE OWNER TO SECURE AND MAINTAIN THE DEMOLITION PERMITS AND ASSOCIATED ROAD OPENING PERMITS IN ACCORDANCE WITH THE CITY OF ELIZABETH (CITY) AND OTHER APPLICABLE REGULATIONS. INCLUDING US EPA "NOTIFICATION OF DEMOLITION AND RENOVATION" WHICH SHALL BE SUBMITTED TO THE NEW JERSEY DEPARTMENT OF HEALTH.
16. **INSURANCE:** CONTRACTOR SHALL PROVIDE A COPY OF A CURRENT CERTIFICATE OF INSURANCE AND ANY SUBCONTRACTOR'S CERTIFICATE OF INSURANCE. POLICIES WILL NEED TO INCLUDE WORKER'S COMPENSATION, COMPREHENSIVE GENERAL LIABILITY, AUTOMOBILE LIABILITY AND ENVIRONMENTAL / ASBESTOS AND POLLUTION LIABILITY. COVERAGE SHALL BE WRITTEN ON AN OCCURRENCE BASIS WITH A. M. BEST A-RATED COMPANIES. THE INSURANCE POLICY LIMITS SHALL BE AS REQUIRED BY UNION COUNTY AND SHALL ADD A "HOLD HARMLESS INSURANCE STATEMENT" AS REQUIRED BY UNION COUNTY.
17. **LICENSES:** CONTRACTOR SHALL SUBMIT TO THE OWNER AND THE CITY ALL APPLICABLE, CURRENT LICENSES. LICENSES SHALL BE KEPT CURRENT FOR THE DURATION OF PROJECT. ALL EMPLOYEES ON SITE MUST BE PROPERLY LICENSED IN ACCORDANCE WITH STATE STATUTES.
18. **TEMPORARY FACILITIES**: CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL TEMPORARY FACILITIES AS DEEMED NECESSARY BY PROJECT REQUIREMENTS INCLUDING, BUT NOT LIMITED TO THAT INDICATED IN THE SITE DEMOLITION PLAN.
19. **WASTE MANAGEMENT PLAN**: CONTRACTOR SHALL SUBMIT A WASTE MANAGEMENT PLAN DETAILING ANTICIPATED WASTE STREAMS, HANDLING, PROCESSING AND PACKAGING OF WASTE STREAMS AND DISPOSITION OF WASTE STREAMS. THE WASTE MANAGEMENT PLAN CAN BE INCLUDED IN THE CONTRACTOR'S CONSTRUCTION WORK PLAN.
20. **MANIFESTS:** THE CONTRACTOR SHALL PROVIDE APPROPRIATE WASTE DISPOSAL MANIFESTS TO BE EXECUTED BY THE COMPANY OR THEIR DESIGNATED REPRESENTATIVE COMPANY.
21. **DEMOLITION WASTE:** UNLESS OTHERWISE INDICATED, DEMOLITION WASTE BECOMES PROPERTY OF CONTRACTOR.
22. **HISTORIC ITEMS**, RELICS, ANTIQUES, AND SIMILAR OBJECTS INCLUDING, BUT NOT LIMITED TO, CORNERSTONES AND THEIR CONTENTS, COMMEMORATIVE PLAQUES AND TABLETS, AND OTHER ITEMS OF INTEREST OR VALUE TO UNION COUNTY THAT MAY BE ENCOUNTERED AND/OR IDENTIFIED BY THE THE OWNER DURING DEMOLITION, REMAIN THE PROPERTY OF UNION COUNTY. CONTRACTOR SHALL CAREFULLY HANDLE IN A MANNER TO PREVENT DAMAGE AND PROMPTLY RETURN TO THE OWNER.
23. **PROJECT KICKOFF MEETING**: CONTRACTOR SHALL CONDUCT A MEETING AT PROJECT SITE FOLLOWING AWARD OF CONTRACT AND PRIOR TO ABATEMENT/DEMOLITION TO:

A. INSPECT AND DISCUSS CONDITION OF CONSTRUCTION TO BE DEMOLISHED.
B. REVIEW STRUCTURAL LOAD LIMITATIONS OF EXISTING STRUCTURES.
C. REVIEW AND FINALIZE BUILDING DEMOLITION SCHEDULE AND VERIFY AVAILABILITY OF DEMOLITION PERSONNEL, EQUIPMENT, AND FACILITIES NEEDED TO MAKE PROGRESS AND AVOID DELAYS.
D. REVIEW AND FINALIZE PROTECTION REQUIREMENTS.
E. REVIEW PROCEDURES FOR NOISE CONTROL, VIBRATION CONTROL AND DUST CONTROL.
F. REVIEW PROCEDURES FOR PROTECTION OF ADJACENT BUILDINGS.
G. REVIEW ITEMS TO BE SALVAGED AND RETURNED TO THE OWNER.
H. REVIEW THE DEMOLITION METHOD.

35. **HEALTH AND SAFETY PLAN (HASP):** THE CONTRACTOR SHALL DEVELOP A SITE-SPECIFIC HASP FOR THEIR OPERATIONS THAT MEETS THE REQUIREMENTS OF APPLICABLE FEDERAL, STATE, AND LOCAL REQUIREMENTS AS WELL AS ANY UNION COUNTY REQUIREMENTS. THE CONTRACTOR SHALL IMPLEMENT THIS PLAN TAKING PRECAUTIONS AS NECESSARY TO PROTECT THE PUBLIC AND WORK FORCE PERSONNEL FROM POTENTIAL HAZARDS. THE CONTRACTOR SHALL HANDLE ALL WASTES IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REQUIREMENTS.
36. **EXPLOSIVES:** USE OF EXPLOSIVES IS NOT PERMITTED.
37. **DISPOSAL OF DEMOLISHED MATERIALS**

A. REMOVE DEMOLITION WASTE MATERIALS FROM PROJECT SITE AND LEGALLY DISPOSE OF THEM IN AN APPROVED LANDFILL OR RECYCLING FACILITY ACCEPTABLE TO UNION COUNTY AND AUTHORITIES HAVING JURISDICTION.
- DO NOT ALLOW DEMOLISHED MATERIALS TO ACCUMULATE ON-SITE.
- REMOVE AND TRANSPORT DEBRIS IN A MANNER THAT WILL PREVENT SPILLAGE ON ADJACENT SURFACES AND AREAS.

B. REMOVE SURPLUS SOIL MATERIAL, UNSUITABLE TOPSOIL, OBSTRUCTIONS, DEMOLISHED MATERIALS, AND WASTE MATERIALS INCLUDING TRASH AND DEBRIS, AND LEGALLY DISPOSE OF THEM OFF SITE.
C. SEPARATE RECYCLABLE MATERIALS PRODUCED DURING SITE CLEARING FROM OTHER NONRECYCLABLE MATERIALS. STORE OR STOCKPILE WITHOUT INTERMIXING WITH OTHER MATERIALS AND TRANSPORT THEM TO APPROVED RECYCLING FACILITIES.
D. DO NOT BURN DEMOLISHED MATERIALS.

36. **SECURITY NOTES**

A. THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING SECURITY OF THE SITE TWENTY-FOUR (24) HOURS A DAY, SEVEN (7) DAYS A WEEK INCLUDING HOLIDAYS THROUGHOUT THE DURATION OF THE CONTRACT.
B. THE CONTRACTOR WILL MAKE NO CLAIM AGAINST UNION COUNTY AND UNION COUNTY'S CONSULTANTS FOR DAMAGE RESULTING FROM TRESPASSING.
C. THE PARTY RESPONSIBLE FOR SECURITY WILL MAKE GOOD ALL DAMAGE TO PROPERTY OF UNION COUNTY AND OTHERS RESULTING FROM FAILURE TO PROVIDE ADEQUATE SECURITY.
D. IF EXISTING FENCING OR BARRIERS ARE BREACHED OR REMOVED FOR PURPOSES OF CONSTRUCTION, THE CONTRACTOR SHOULD PROVIDE AND MAINTAIN TEMPORARY SECURITY FENCING IN A MANNER SATISFACTORY TO THE OWNER.
E. THE CONTRACTOR WILL MAINTAIN A SECURITY PROGRAM THROUGHOUT DEMOLITION AND RESTORATION OPERATIONS.

STRUCTURAL NOTES

1. DUE TO AN UNBALANCED LOAD BETWEEN EXISTING GRADE AND GROUND FLOOR/BASEMENT SLAB ON GRADE PER THE APPROXIMATE BASEMENT LOCATION INDICATED, THE FOUNDATION WALLS MAY BECOME UNSTABLE AFTER THE REMOVAL OF THE FLOOR STRUCTURES; THEREFORE, PRIOR TO THE REMOVAL OF THE ROOF/FLOOR STRUCTURES, THE CONTRACTOR MAY BE REQUIRED TO RELIEVE THE PRESSURE ON THE WALLS WITHIN THE LIMIT OF DISTURBANCE AS INDICATED ON THE DRAWINGS. THE CONTRACTOR SHALL REVIEW THIS CONDITION TO CONFIRM ANY ASSOCIATED REQUIREMENTS.
2. IF THERE IS ANY TEMPORARY BRACING REQUIRED TO PROTECT ADJACENT ROADWAYS, PARKING AREAS AND SAFEGUARD UTILITIES, THESE BRACING SYSTEMS SHALL BE DESIGNED BY A STRUCTURAL ENGINEER (RETAINED BY THE CONTRACTOR) LICENSED IN THE STATE OF NEW JERSEY. PRIOR TO DEMOLITION, SIGNED AND SEAL CALCULATIONS WITH DRAWINGS SHALL BE FORWARDED TO THE CITY ENGINEER FOR REVIEW.

EARTHWORK NOTES

1. UPON COMPLETION OF EXCAVATION TO THE PROPOSED SUBGRADE, ALL SUBGRADE SURFACES SHALL BE MOISTURE CONDITIONED AS NECESSARY AND COMPACTED TO 95 PERCENT OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY (ASTM D1557).
2. UNSUITABLE MATERIALS, INCLUDING DEBRIS AND REMNANT TOP SOIL SHALL BE COMPLETELY REMOVED AND REPLACED WITH CLEAN FILL COMPACTED IN ACCORDANCE WITH NOTE 1, ABOVE.
3. STRUCTURAL FILL AND BACKFILL MATERIAL SHALL BE PLACED IN MAXIMUM EIGHT INCH THICK LOOSE LIFTS, MOISTURE CONDITIONED AS REQUIRED AND COMPACTED TO AT LEAST 95 PERCENT OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY.
4. SLOPING GROUND TO RECEIVE FILL SHALL BE FREE OF VEGETATION, EXISTING FILL AND LOOSE OR DISTURBED MATERIAL. USE SMALLER HAND-OPERATED EQUIPMENT, WITH THINNER LIFTS, IF NECESSARY, TO ACHIEVE COMPACTION.
5. CLEAN FILL MATERIAL PLACED ON SLOPING GROUND SHALL BE KEYED AND BENCHED INTO EXISTING SLOPES.
6. IF FILL OPERATIONS ARE CONDUCTED DURING PERIODS OF FREEZING WEATHER, NO FILL SHALL BE PLACED ON SNOW, ICE OR FROZEN SUBGRADE AND THAT NO FROZEN FILL SHALL BE PLACED.
7. DURING CONSTRUCTION, PROPER EROSION AND SEDIMENT CONTROL MEASURES MUST BE IMPLEMENTED. PROPER TEMPORARY AND PERMANENT EROSION CONTROL MEASURES SHALL BE IMPLEMENTED.
8. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL MEANS AND METHODS, CONSTRUCTION HEALTH AND SAFETY MEASURES, SURVEY CONTROL, DIMENSIONS AND QUALITY CONTROL. QUALIFIED GEOTECHNICAL PERSONNEL SHALL OBSERVE AND DOCUMENT SUBGRADE PREPARATION, COMPACTION AND EARTHWORK.
9. THE CONTRACTOR SHALL PROCURE CERTIFIED CLEAN FILL IN ACCORDANCE WITH "NJDEP FILL MATERIAL GUIDELINES FOR SRP SITES", THE NJDEP TECHNICAL REQUIREMENTS FOR SITE REMEDIATION 7:26e 5.2, AND AS APPROVED BY BY THE OWNER. THE CONTRACTOR SHALL PROVIDE THE SAMPLING DOCUMENTATION AND DOCUMENTATION ESTABLISHING THAT THE FILL IS CLEAN VIRGIN MATERIAL FROM THE BORROW SOURCE (QUARRY) OR ORIGIN. IMPORTED CLEAN FILL WILL CONSIST OF WELL GRADED SOIL OR GRAVEL MEETING THE REQUIREMENTS OF NJDOT STANDARD SPECIFICATION SECTION 901.11 SOIL AGGREGATE WITH I-5 DESIGNATION. FILL MATERIAL SHALL BE FREE FROM FROZEN MATERIALS, PERISHABLE RUBBISH, PEAT, CLAY LUMPS, AND OTHER UNSATISFACTORY SOIL OR MATERIALS.

SUBGRADE FILL (I-5)

U.S STANDARD SIEVESIZE	PERCENT FINER (BY WEIGHT)
2"	100
¾"	70 – 100
No.4	30 – 80
No. 50	10 – 35
No.200	5 – 12

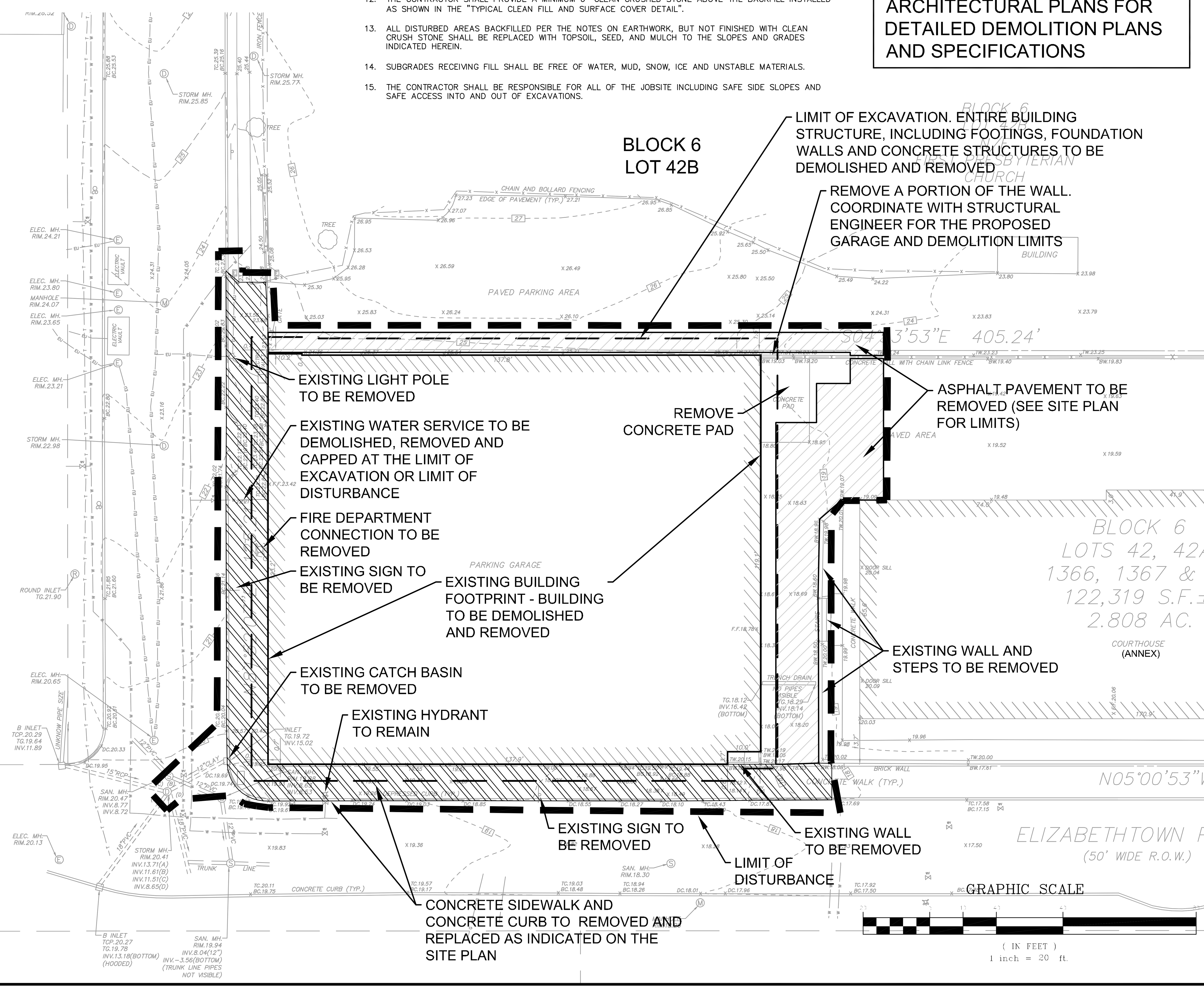
10. IF ANY ENVIRONMENTAL REMEDIAL EXCAVATION IS REQUIRED, THE LIMITS OF THE EXCAVATION WILL BE OBSERVED BY THE OWNER ONSITE REPRESENTATIVE FOR ANY EVIDENCE OF CONTAMINATION. THE CONTRACTOR SHALL NOT BE PERMITTED TO COMMENCE BACKFILLING UNTIL THE FINAL LIMITS OF THE EXCAVATION ARE REVIEWED AND APPROVED BY THE OWNER ONSITE REPRESENTATIVE. THE CONTRACTOR SHOULD ASSUME THAT POST EXCAVATION SAMPLES WILL BE RUN ON A 48-HOUR TURNAROUND TIME, AND THAT BACKFILLING CAN COMMENCE UPON RECEIPT OF ACCEPTABLE RESULTS.
11. THE CONTRACTOR WILL ASSIST THE OWNER ONSITE REPRESENTATIVE WITH THE COLLECTION OF POST EXCAVATION SAMPLES, AS NECESSARY.
12. THE CONTRACTOR SHALL PROVIDE A MINIMUM 6" CLEAN CRUSHED STONE ABOVE THE BACKFILL INSTALLED AS SHOWN IN THE "TYPICAL CLEAN FILL AND SURFACE COVER DETAIL".
13. ALL DISTURBED AREAS BACKFILLED PER THE NOTES ON EARTHWORK, BUT NOT FINISHED WITH CLEAN CRUSH STONE SHALL BE REPLACED WITH TOPSOIL, SEED, AND MULCH TO THE SLOPES AND GRADES INDICATED HEREIN.
14. SUBGRADES RECEIVING FILL SHALL BE FREE OF WATER, MUD, SNOW, ICE AND UNSTABLE MATERIALS.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OF THE JOBSITE INCLUDING SAFE SIDE SLOPES AND SAFE ACCESS INTO AND OUT OF EXCAVATIONS.

REFERENCE NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD-1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD-1988.

NORTH

THIS PLAN IS FOR INFORMATION PURPOSES ONLY - REFER TO ARCHITECTURAL PLANS FOR DETAILED DEMOLITION PLANS AND SPECIFICATIONS



REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

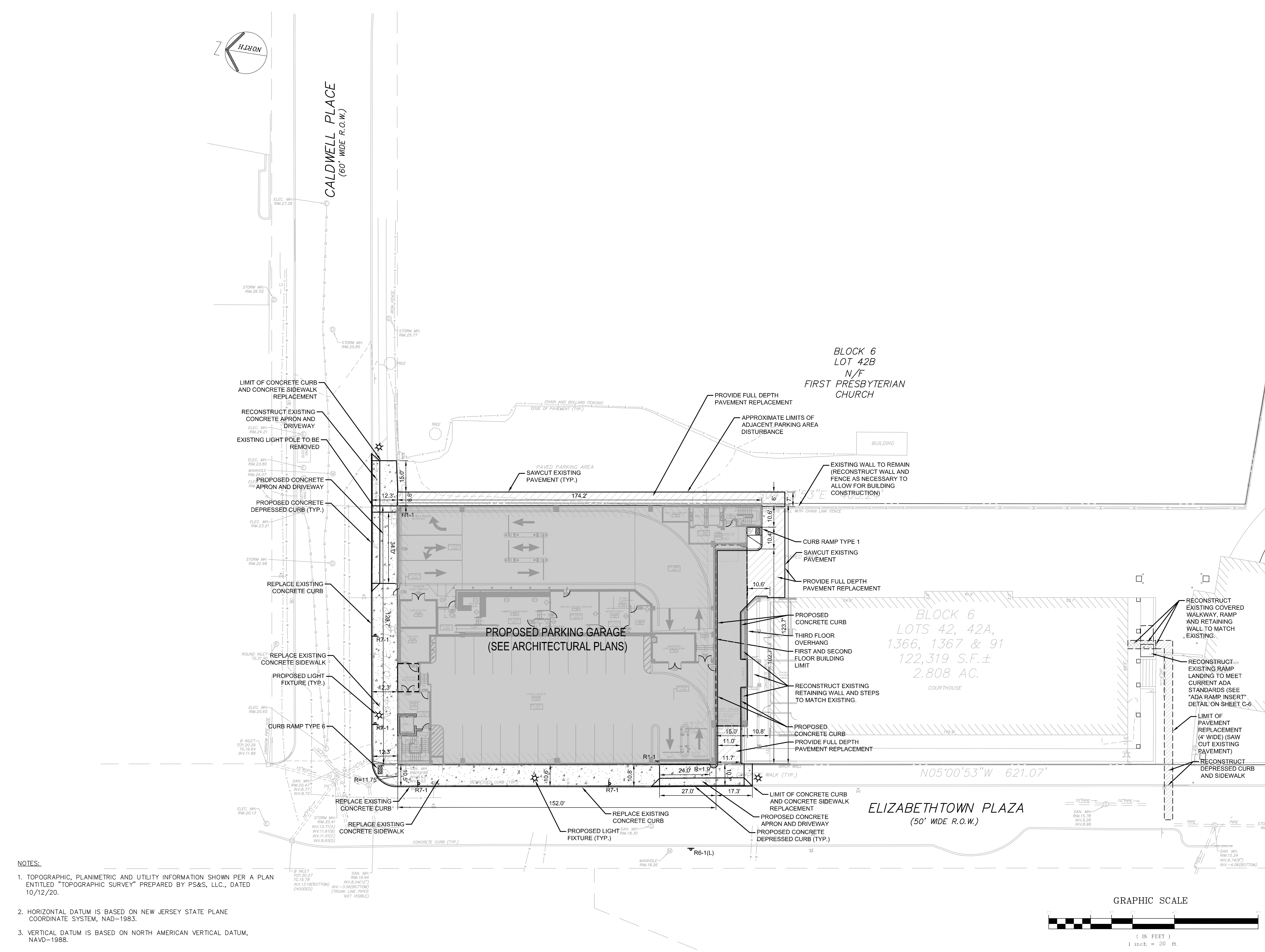
BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

DEMOLITION PLAN

PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF
SHEET NO.	C-4		

FILE NAME: P:\03009\0003\DWGs\C-Civil\Plotdwgs\C04-DEMO.dwg LAST EDIT: 07/27/2021 - 05:05:31 PM LOGIN: amontano



NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD–1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD–1988.

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR, LLC. OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.

ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT.

THE COPYING AND/OR MODIFICATION OF THIS DOCUMENT OR ANY PORTION THEREOF WITHOUT THE WRITTEN PERMISSION OF PAULUS, SOKOLOWSKI AND SARTOR, LLC. IS PROHIBITED.

UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE", THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR IMPROVEMENTS DEPICTED HEREON. CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

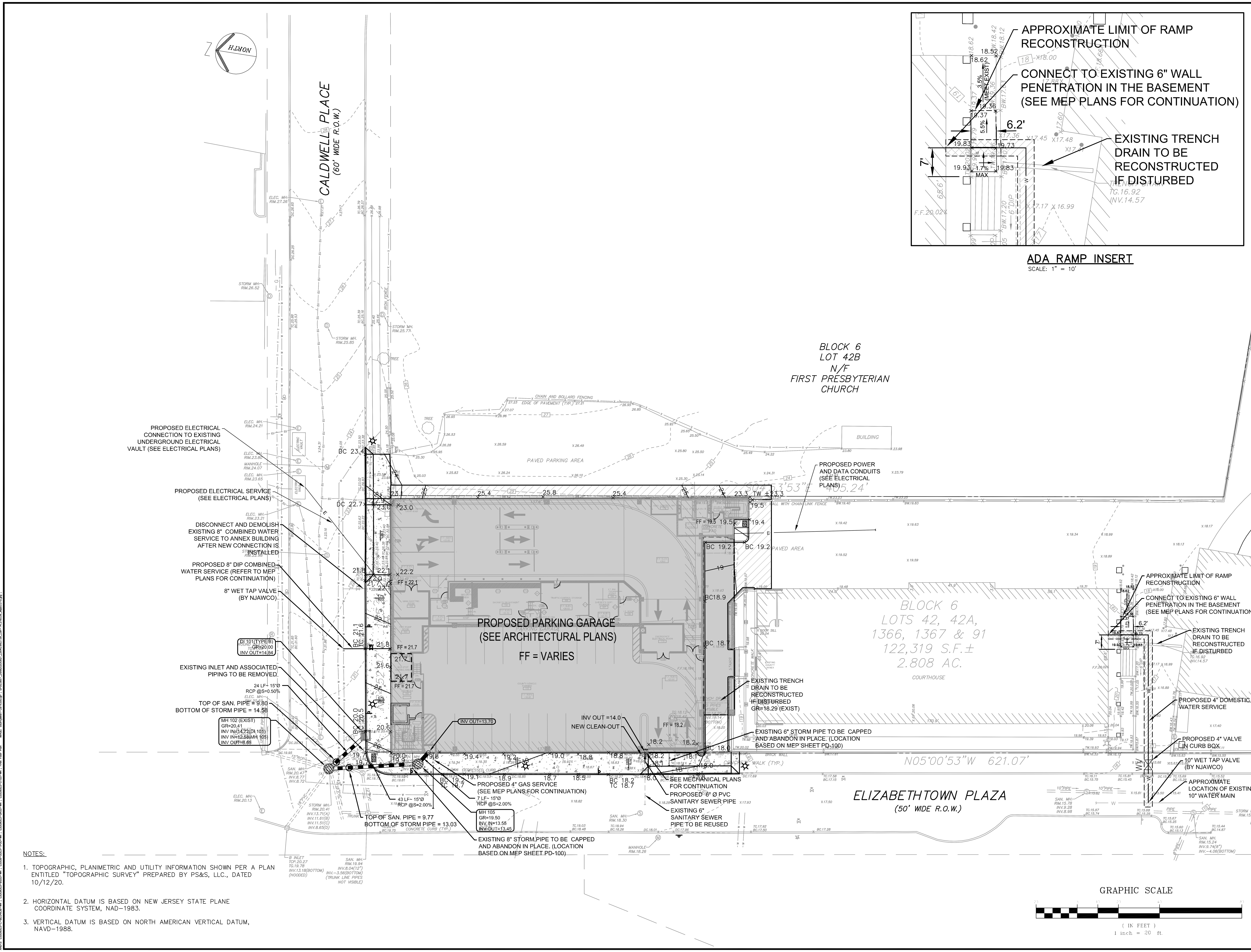
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

SITE
PLAN

PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF
SHEET NO.	C-5		



NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD-1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD-1988.

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/12/21	ADDENDUM 1
5	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR, LLC. OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.

ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT.

THE COPYING AND/OR MODIFICATION OF THIS DOCUMENT OR ANY PORTION THEREOF WITHOUT THE WRITTEN PERMISSION OF PAULUS, SOKOLOWSKI AND SARTOR, LLC. IS PROHIBITED.

UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE", THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR IMPROVEMENTS DEPICTED HEREIN. CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

GRADING & UTILITY PLAN

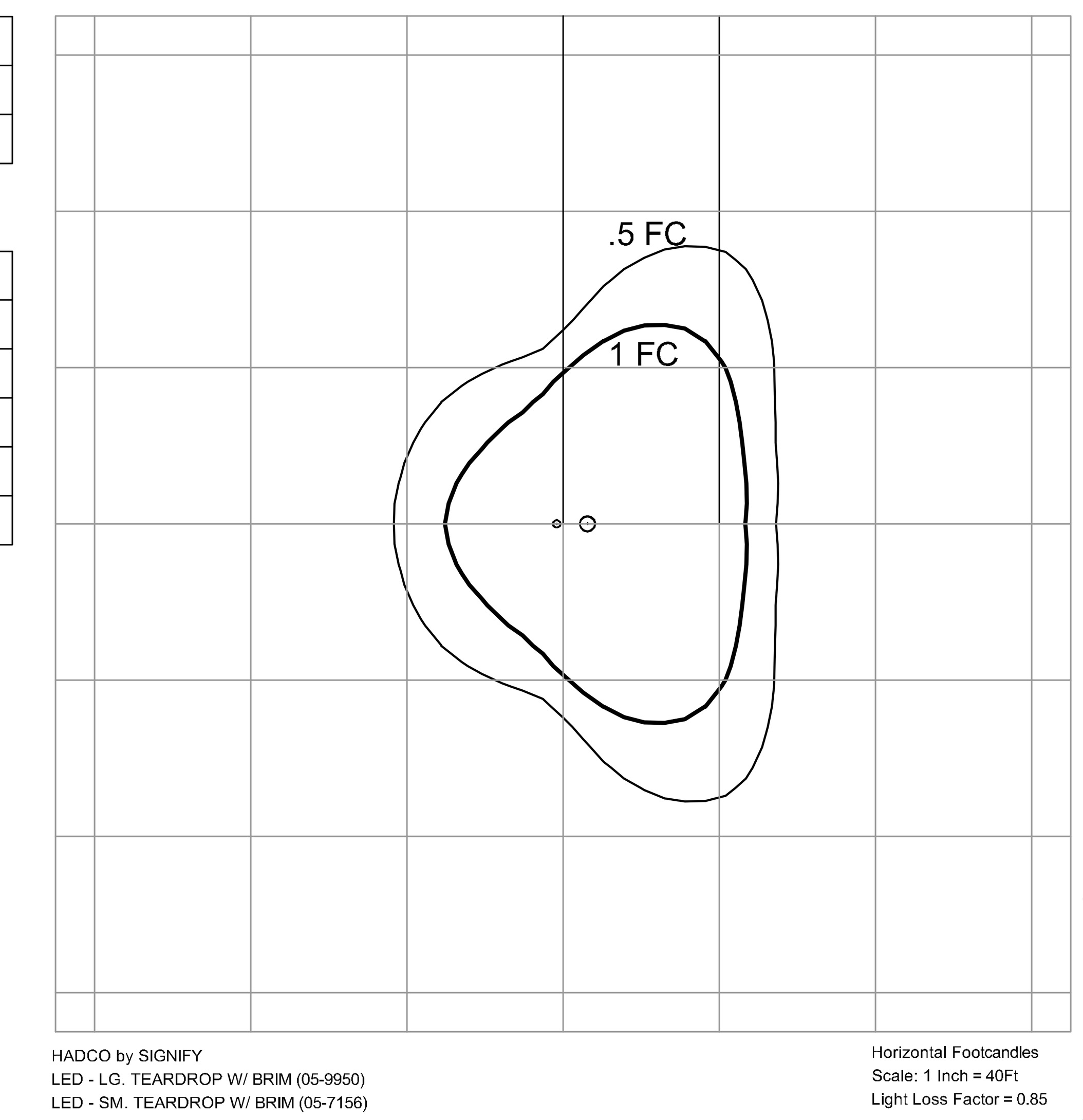
PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF
SHEET NO.	C-6		

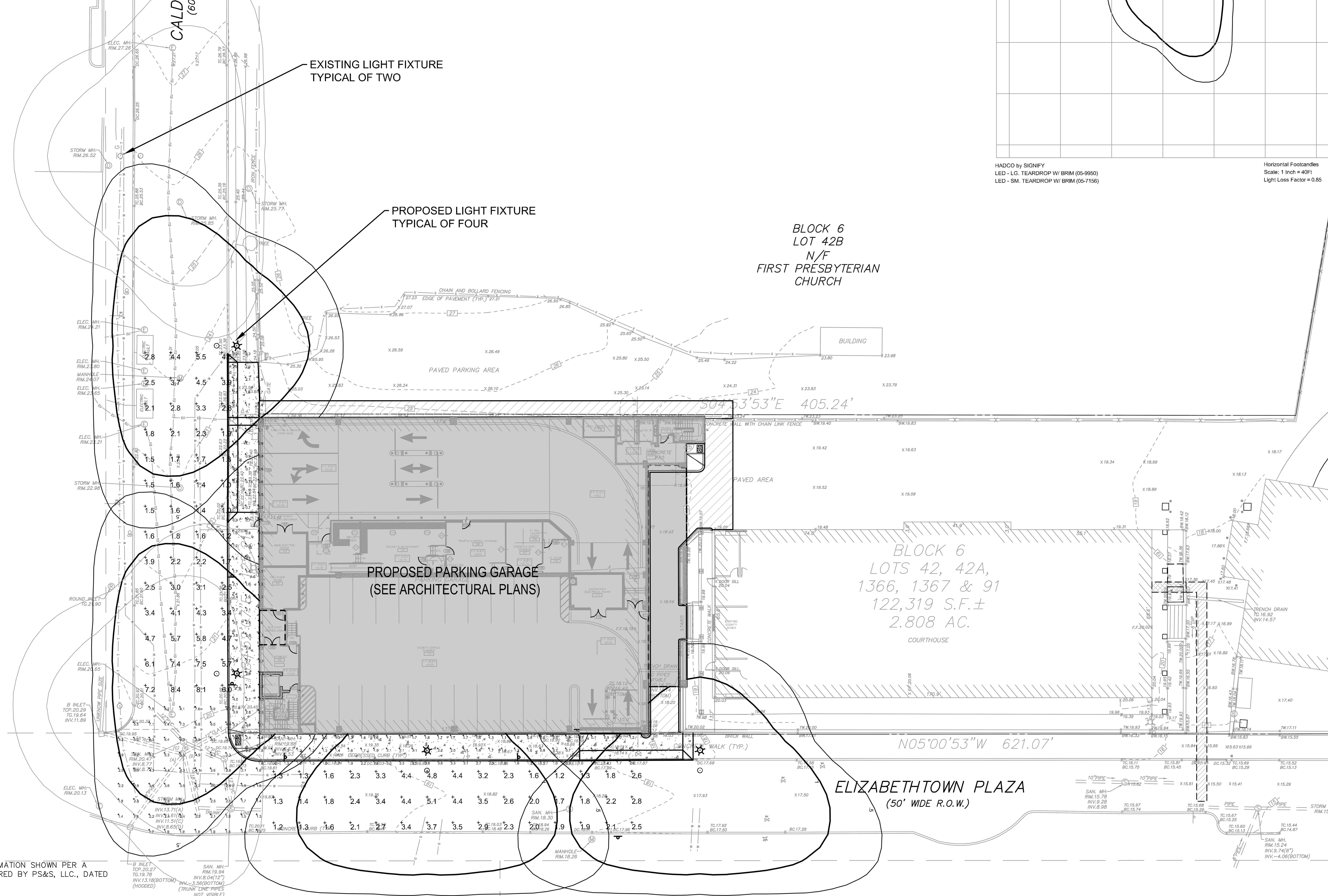
Luminaire Schedule

Symbol	Qty	Label	Arr. Lum. Lumens	Total Watts	LLF	Description
⊙ ⊙	6	C2107-DWG03	22808	1089.6	0.850	05-9950 & 05-7156

Calculation Summary

Label	CalcType	Units	Avg	Max	Min	Avg/Min	Description
Caldwell Place	Illuminance	Fc	3.32	8.4	1.0	3.32	10ft Grid
Elizabethtown Plaza	Illuminance	Fc	2.52	5.1	1.2	2.10	10ft Grid
Intersection	Illuminance	Fc	3.66	8.2	1.3	2.82	6ft Grid
Sidewalks	Illuminance	Fc	1.73	4.3	0.5	3.46	5ft Grid





GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD-1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD-1988.
4. REFER TO ARCHITECTURAL PLANS FOR PROPOSED BUILDING MOUNTED LIGHTS

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

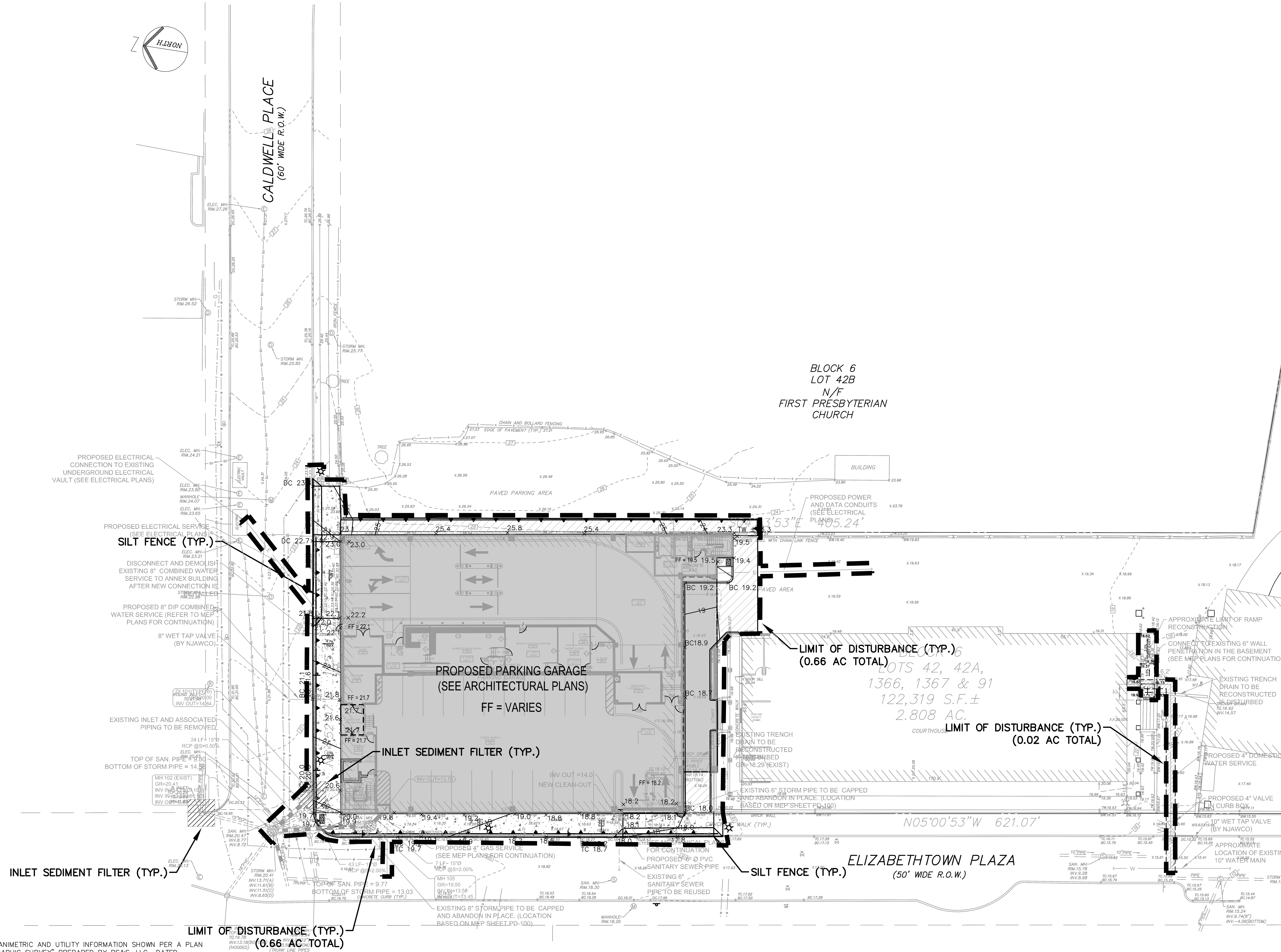
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

SITE
LIGHTING
PLAN

PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF
SHEET NO.	C-7		



NOTES:

1. TOPOGRAPHIC, PLANIMETRIC AND UTILITY INFORMATION SHOWN PER A PLAN ENTITLED "TOPOGRAPHIC SURVEY" PREPARED BY PS&S, LLC., DATED 10/12/20.
2. HORIZONTAL DATUM IS BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD–1983.
3. VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM, NAVD–1988.

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

SEAL OF THE COUNTY OF UNION NEW JERSEY 1857

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR, LLC. OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.

ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT.

THE COPYING AND/OR MODIFICATION OF THIS DOCUMENT OR ANY PORTION THEREOF WITHOUT THE WRITTEN PERMISSION OF PAULUS, SOKOLOWSKI AND SARTOR, LLC. IS PROHIBITED.

UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE", THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR IMPROVEMENTS DEPICTED HEREON. CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

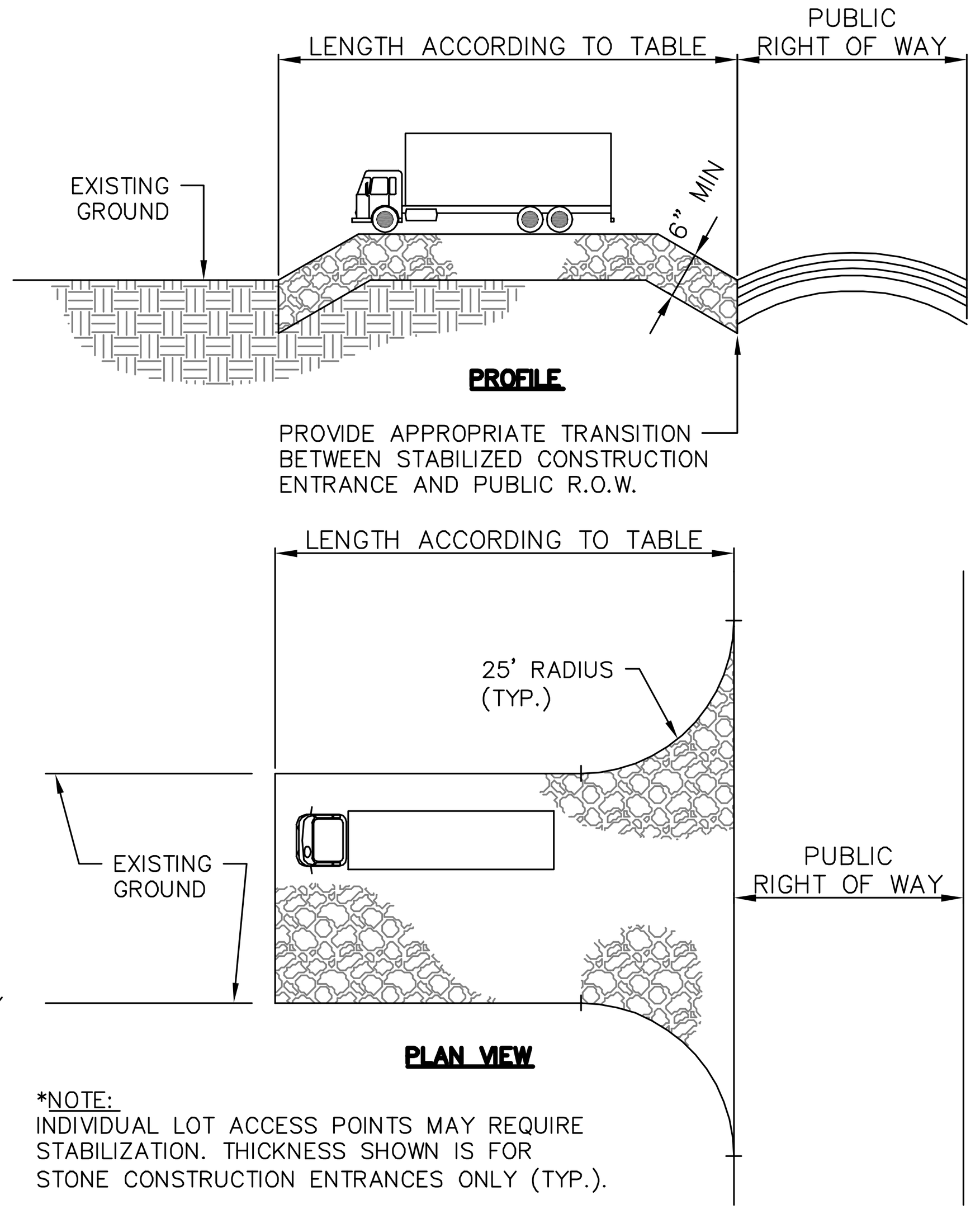
SOIL EROSION AND SEDIMENT CONTROL PLAN

PROJECT NO.:	03009-003	DRAWN BY:	AM
SCALE:	1" = 20'	CHECKED BY:	PAR
DATE:	11-30-2020	SHEET	OF
SHEET NO.			

C-8

SOMERSET–UNION SOIL CONSERVATION NOTES

1. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCES, OR IN THEIR PROPER SEQUENCE AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
2. ANY DISTURBED AREAS THAT WILL BE LEFT EXPOSED MORE THAN 30 DAYS AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL IMMEDIATELY RECEIVE A TEMPORARY SEEDING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF A TEMPORARY COVER, THE DISTURBED AREAS WILL BE MULCHED WITH STRAW, OR EQUIVALENT MATERIAL, AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO NJ STATE STANDARDS
3. PERMANENT VEGETATION SHALL BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN TEN (10) DAYS AFTER FINAL GRADING. MULCH WILL BE USED FOR PROTECTION UNTIL SEEDING IS ESTABLISHED
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE NJ STATE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY, 7TH EDITION LAST REVISED JANUARY 2014
5. A SUB-BASE COURSE WILL BE APPLIED IMMEDIATELY FOLLOWING ROUGH GRADING AND INSTALLATION OF IMPROVEMENTS IN ORDER TO STABILIZE STREETS, ROADS, DRIVEWAYS AND PARKING AREAS. IN AREAS WHERE NO UTILITIES ARE PRESENT, THE SUB-BASE SHALL BE INSTALLED WITHIN 15 DAYS OR PRELIMINARY GRADING.
6. IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING ALL CRITICAL AREAS SUBJECT TO EROSION (I.E.: STEEP SLOPES, ROADWAY EMBANKMENTS) WILL RECEIVE A TEMPORARY SEEDING IN COMBINATION WITH STRAW MULCH OR A SUITABLE EQUIVALENT, AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO THE NJ STATE STANDARDS.
7. ANY STEEP SLOPES RECEIVING PIPELINE INSTALLATION WILL BE BACKFILLED AND STABILIZED DAILY, AS THE INSTALLATION PROCEEDS (I.E.: SLOPES GREATER THAT 3:1)
8. TRAFFIC CONTROL STANDARDS REQUIRE THE INSTALLATION OF A 50'X30'X6"PAD OF 1 1/2" OR 2" STONE, AT ALL CONSTRUCTION DRIVEWAYS, IMMEDIATELY AFTER INITIAL SITE DISTURBANCE.
9. THE SOMERSET-UNION SOIL CONSERVATION DISTRICT SHALL BE NOTIFIED IN WRITING 48 HOURS IN ADVANCE OF ANY LAND DISTURBING ACTIVITY.
10. AT THE TIME WHEN THE SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS GOING TO BE ACCOMPLISHED, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROUND COVER, SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT WILL PERMANENTLY ADJUST THE SOIL CONDITIONS AND RENDER IT SUITABLE FOR VEGETATIVE GROUND COVER. IF THE REMOVAL OR TREATMENT OF THE SOIL WILL NOT PROVIDE SUITABLE CONDITIONS, NON-VEGETATIVE MEANS OF PERMANENT GROUND STABILIZATION WILL HAVE TO BE EMPLOYED. TOPSOIL SHOULD BE HANDLED ONLY WHEN IT IS DRY ENOUGH TO WORK WITHOUT DAMAGING THE SOIL STRUCTURE. A UNIFORM APPLICATION TO A DEPTH OF 5 INCHES (UNSETTLED) IS REQUIRED ON ALL SITES.
11. IN THAT NJSA 4:24-39 ET SEQ., REQUIRES THAT NO CERTIFICATE OF OCCUPANCY BE ISSUED BEFORE THE PROVISIONS OF THE CERTIFIED PLAN FOR SOIL EROSION AND SEDIMENT CONTROL HAVE BEEN COMPLIED WITH FOR PERMANENT MEASURES, ALL SITE WORK FOR SITE PLANS AND ALL WORK AROUND INDIVIDUAL LOTS IN SUBDIVISIONS, WILL HAVE TO BE COMPLETED PRIOR TO THE DISTRICT ISSUING A REPORT OF COMPLIANCE FOR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY BY THE MUNICIPALITY.
12. CONDUIT OUTLET PROTECTION MUST BE INSTALLED AT ALL REQUIRED OUTFALLS PRIOR TO THE DRAINAGE SYSTEM BECOMING OPERATIONAL.
13. ANY CHANGES TO THE CERTIFIED SOIL EROSION AND SEDIMENT CONTROL PLAN WILL REQUIRE THE SUBMISSION OF REVISED SOIL EROSION AND SEDIMENT CONTROL PLANS TO THE DISTRICT FOR RE-CERTIFICATION. THE REVISED PLANS MUST MEET ALL CURRENT NJ STATE SOIL EROSION & SEDIMENT CONTROL STANDARDS.
14. THE SOMERSET-UNION SOIL CONSERVATION DISTRICT SHALL BE NOTIFIED OF ANY CHANGES IN OWNERSHIP.
15. MULCHING TO THE NJ STANDARDS IS REQUIRED FOR OBTAINING A CONDITIONAL REPORT OF COMPLIANCE. CONDITIONALS ARE ONLY ISSUED WHEN THE SEASON PROHIBITS SEEDING.
16. CONTRACTOR IS RESPONSIBLE FOR KEEPING ALL ADJACENT ROADS CLEAN DURING LIFE OF CONSTRUCTION PROJECT.
17. THE DEVELOPER SHALL BE RESPONSIBLE FOR REMEDIATING ANY EROSION OR SEDIMENT PROBLEMS THAT ARISE AS A RESULT OF ONGOING CONSTRUCTION AT THE REQUEST OF THE SOMERSET-UNION SOIL CONSERVATION DISTRICT.
18. HYDRO SEEDING IS A TWO- STEP PROCESS. THE FIRST STEP INCLUDES SEED, FERTILIZER, LIME, ETC., ALONG WITH MINIMAL AMOUNTS OF MULCH TO PROMOTE CONSISTENCY, GOOD SEED TO SOIL CONTACT, AND GIVE A VISUAL INDICATION OF COVERAGE. UPON COMPLETION OF SEEDING OPERATION, HYDRO-MULCH SHOULD BE APPLIED AT A RATE OF 1500 LBS. PER ACRE IN SECOND STEP. THE USE OF HYDRO-MULCH, AS OPPOSED TO STRAW, IS LIMITED TO OPTIMUM SEEDING DATES AS LISTED IN THE NJ STANDARDS.



*NOTE:
INDIVIDUAL LOT ACCESS POINTS MAY REQUIRE STABILIZATION. THICKNESS SHOWN IS FOR STONE CONSTRUCTION ENTRANCES ONLY (TYP.).

TABLE OF LENGTHS OF CONSTRUCTION EXITS ON SLOPING ROADBEDS

	LENGTH OF STONE REQUIRED	
PERCENT SLOPE OF ROADWAY	COARSE GRAINED SOILS	FINE GRAINED SOILS
0 TO 2%	50 ft.	100ft.
2 TO 5%	100ft.	200ft.
> 5%	ENTIRE SURFACE STABILIZED WITH FABC BASE COURSE (NOTE 1)	

1. AS PRESCRIBED BY LOCAL ORDINANCE OR OTHER GOVERNING AUTHORITY

STABILIZED CONSTRUCTION ACCESS (IF AND WHERE DIRECTED)

NOT TO SCALE

MAINTENANCE

THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO ROADWAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO ROADWAYS (PUBLIC OR PRIVATE) OR OTHER IMPERVIOUS SURFACES MUST BE REMOVED IMMEDIATELY.

WHERE ACCUMULATION OF DUST/SEDIMENT IS INADEQUATELY CLEANED OR REMOVED BY CONVENTIONAL METHODS, A POWER BROOM OR STREET SWEEPER WILL BE REQUIRED TO CLEAN PAVED OR IMPERVIOUS SURFACES. ALL OTHER ACCESS POINTS WHICH ARE NOT STABILIZED SHALL BE BLOCKED OFF.

DESIGN CRITERIA

STONE SIZE – USE ASTM C-33, SIZE No. 2 (2 1/2 TO 1 1/2") OR 3 (2 TO 1"). USE CLEAN CRUSHED ANGULAR STONE. CRUSHED CONCRETE OF SIMILAR SIZE MAY BE SUBSTITUTED BUT WILL REQUIRE MORE FREQUENT UPGRADING AND MAINTENANCE.

THICKNESS – NOT LESS THAN SIX (6) INCHES.

WIDTH – NOT LESS THAN FULL WIDTH OF POINTS OF INGRESS OR EGRESS.

LENGTH – 50 FEET MINIMUM WHERE THE SOILS ARE COURSE GRAINED (SANDS OR GRAVEL) OR 100 FEET MINIMUM WHERE SOILS ARE FINE GRAINED (CLAYS OR SILTS), EXCEPT WHERE TRAVELED LENGTH IS LESS THAN 50 OR 100 FEET RESPECTIVELY. THESE LENGTHS MAY BE INCREASED WHERE FIELD CONDITIONS DICTATE. STORMWATER FROM UP-SLOPE AREAS SHALL BE DIVERTED AWAY FROM THE STABILIZED PAD (SEE "STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NJ" FOR DIVERSIONS, PG. 15-1). WHERE DIVERSION IS NOT POSSIBLE, THE LENGTH OF THE STABILIZED PAD SHALL BE AS SHOWN IN TABLE BELOW. WHERE THE SLOPE OF THE ACCESS ROAD EXCEEDS 5%, A STABILIZED BASE COURSE OF FINE AGGREGATE BITUMINOUS CONCRETE (FABC) SHALL BE INSTALLED. THE TYPE AND THICKNESS OF THE FABC AND USE OF A DENSE GRADE AGGREGATE SUB-BASE SHALL BE AS PRESCRIBED BY LOCAL MUNICIPAL ORDINANCE OR OTHER GOVERNING AUTHORITY. AT POORLY DRAINED LOCATIONS, SUBSURFACE DRAINAGE GRAVEL FILTER OR GEOTEXTILE SHALL BE INSTALLED BEFORE INSTALLING THE STABILIZED CONSTRUCTION ENTRANCE.

CONSTRUCTION SEQUENCE

1.	CONTACT THE SOMERSET-UNION SOIL CONSERVATION DISTRICT A MINIMUM OF 72 HOURS PRIOR TO ANY SOIL DISTURBANCE TO ARRANGE A PRECONSTRUCTION MEETING.	3 DAYS
2.	INSTALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN. DISTURB ONLY THE MINIMUM AREA NEEDED TO INSTALL ALL MEASURES.	5 DAYS
3.	DISCONNECT EXISTING UTILITIES.	2 WEEKS
4.	DEMOLISH EXISTING GARAGE.	8 WEEKS
5.	ROUGH GRADE SITE AND INSTALL UNDERGROUND UTILITIES.	4 WEEKS
6.	CONSTRUCT PROPOSED GARAGE BUILDING FOUNDATION AND SUPERSTRUCTURE.	6 MONTHS
7.	CONSTRUCT CURB, SIDEWALK, PAVING AND FINISH GRADING.	8 WEEK
8.	INSTALL LANDSCAPING.	2 WEEKS
9.	REMOVE ALL SEDIMENT FILTERS, ACCUMULATED SEDIMENT, SILT FENCES.	2 WEEKS
10.	CONTACT SOMERSET-UNION SOIL CONSERVATION DISTRICT FOR FINAL INSPECTION.	1 WEEK

NOTES:
SEQUENCE OF CONSTRUCTION IS APPROXIMATE AND IS SUBJECT TO WEATHER CONDITIONS, LABOR AND MATERIAL AVAILABILITY.

THE ORIGINAL SOMERSET-UNION SOIL CONSERVATION DISTRICT CERTIFICATION AND PLANS MUST BE AVAILABLE AT THE SITE AT ALL TIMES.

DUST CONTROL SPECIFICATIONS

Wind erosion shall be controlled utilizing a combination of methods as deemed appropriate for the specific site conditions.
As a general rule, the smallest practical area of the site will be disturbed at any one point in time. Areas that are disturbed and which will not be subject to vehicular traffic for a period of one week or greater shall be stabilized using one of the following dust control methods. Mulches – See note for Stabilization with Mulches.

Vegetative Cover – See notes for: Temporary Vegetative Cover, Permanent Vegetative Cover and permanent Stabilization with Sod.

Spray-On Adhesives – On mineral soils (not effective on muck soils). Keep traffic off these areas.

	Water Dilution	Type of Nozzle	Apply Gallons/Acre
Anionic asphalt emulsion	7 :1	Coarse Spray	1,200
Latex emulsion	12.5 :1	Fine Spray	235
Resin in water	4 :1	Fine Spray	300

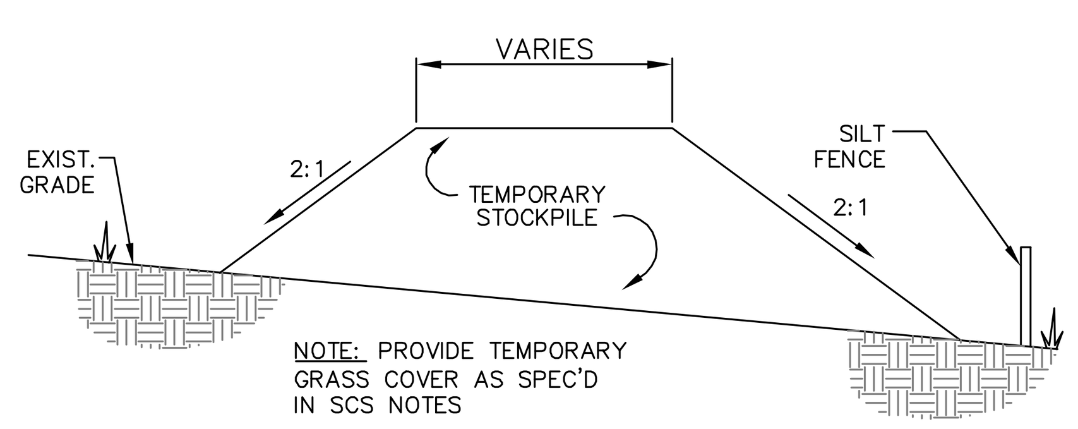
Tillage – To roughen surface and bring clods to the surface. This is a temporary emergency measure which should be used before soil blowing starts. Begin plowing on windward side of equipment which may produce the desired effect.

Sprinkling – Site is sprinkled until the surface is wet.

Barriers – Solid board fences, snow fences, burlap fences, crate walls, bales of hay and similar material can be used to control air currents and soil blowing.

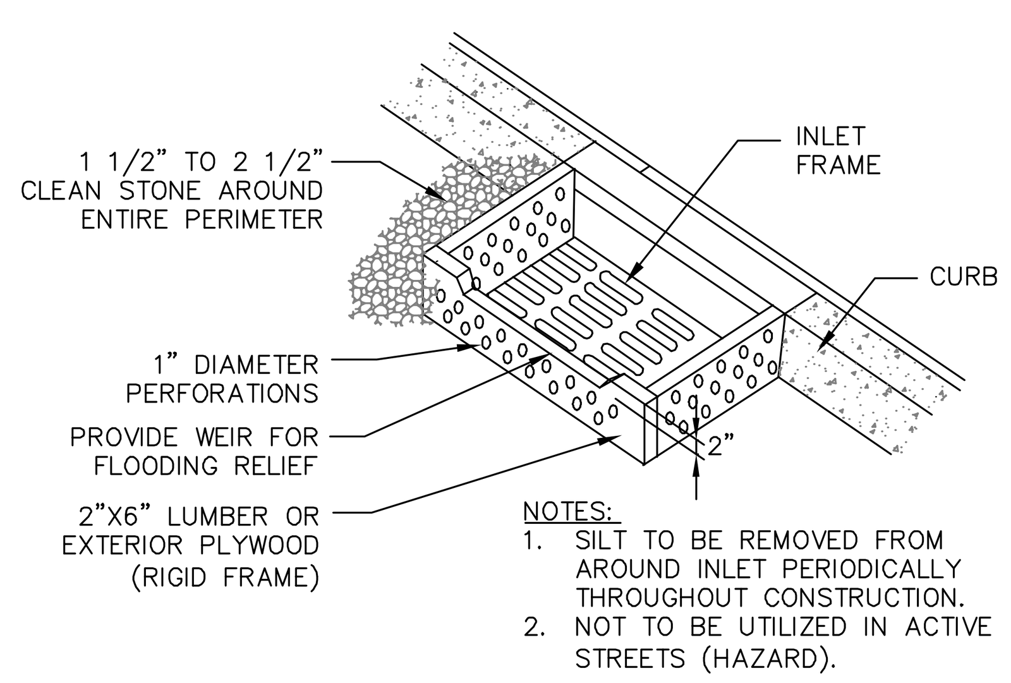
Calcium Chloride – Shall be in the form of loose, dry granules or flakes fine enough to feed through commonly used spreaders at a rate that will keep surface moist but not cause pollution or plant damage. If used on steeper slopes, then use other practices to prevent washing into streams or accumulation around plants.

Stone – Cover surface with crushed stone or coarse gravel.



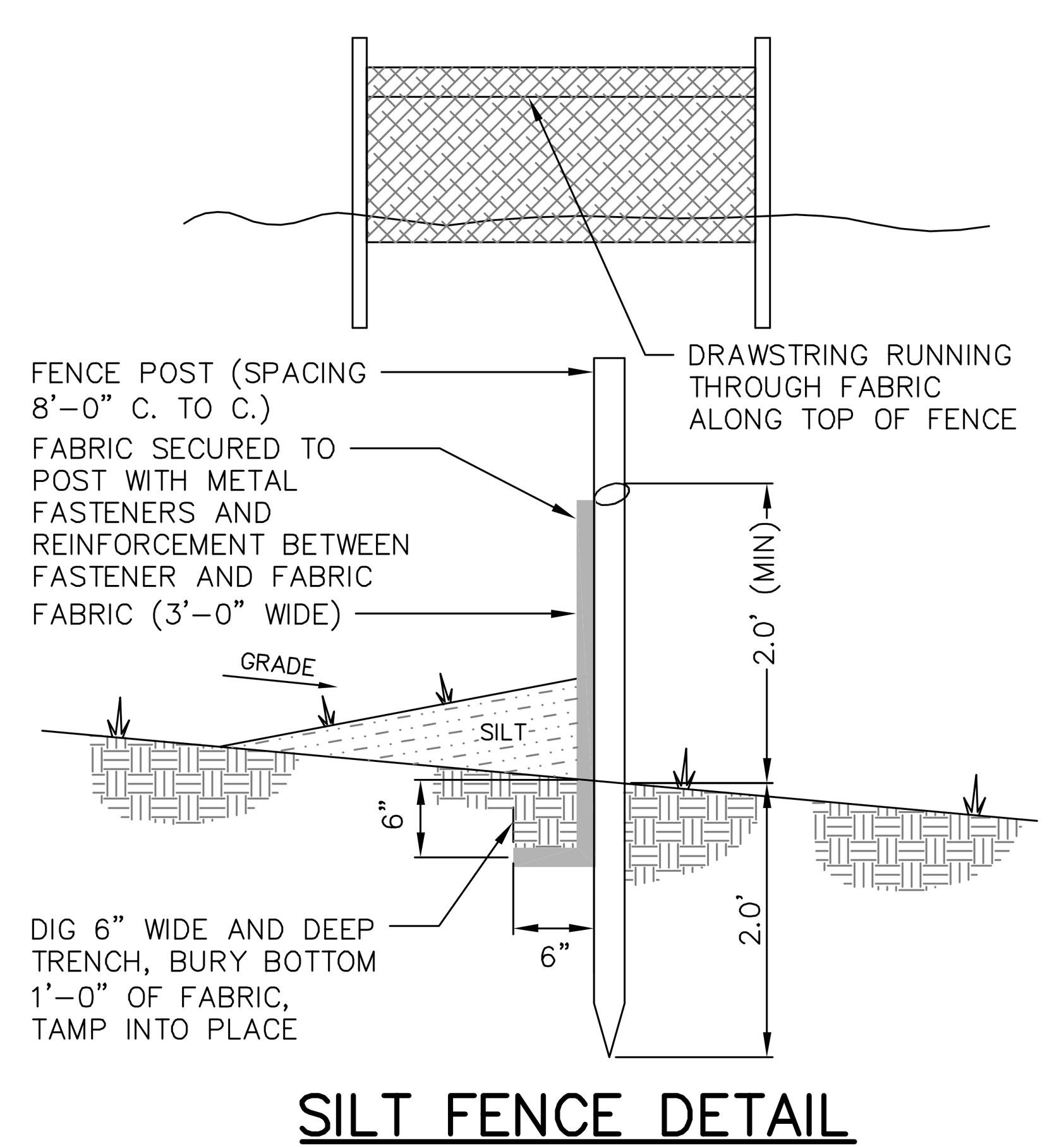
TEMPORARY STOCKPILE (IF AND WHERE DIRECTED)

NOT TO SCALE



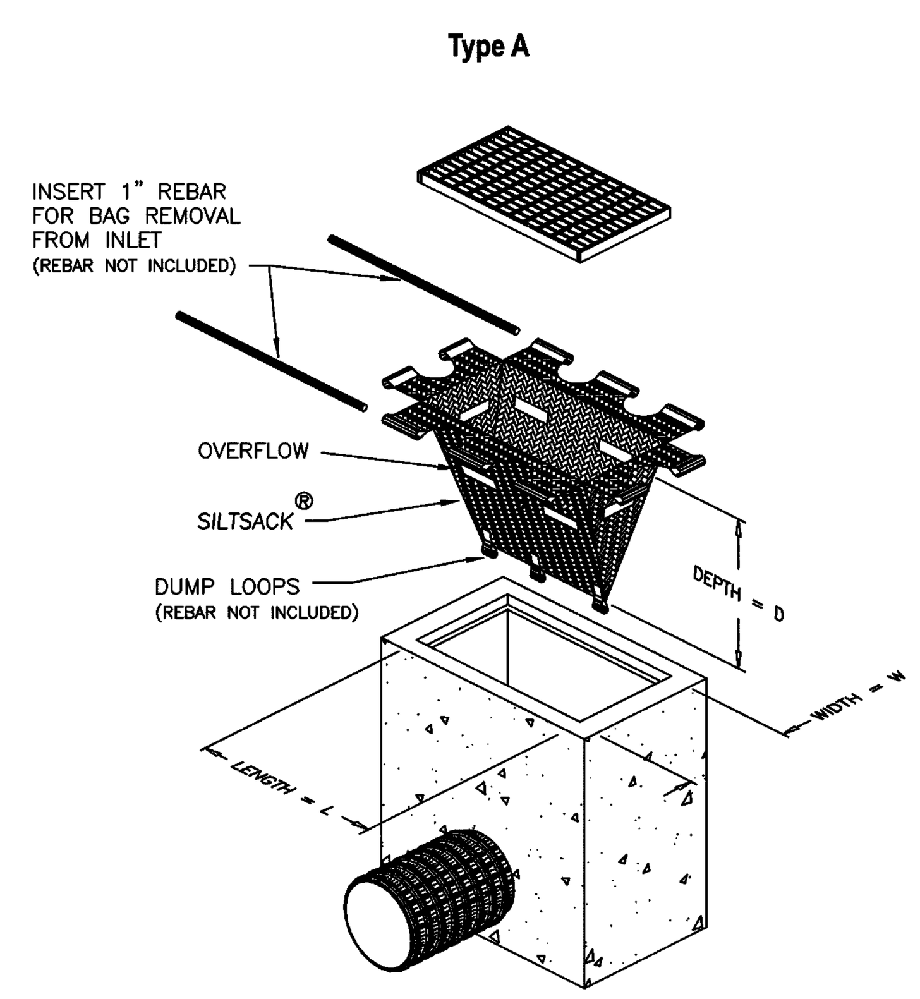
TYPE "B" INLET FILTER DETAIL

NOT TO SCALE



SILT FENCE DETAIL

NOT TO SCALE



INLET PROTECTION DETAIL ALTERNATE

NOT TO SCALE

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

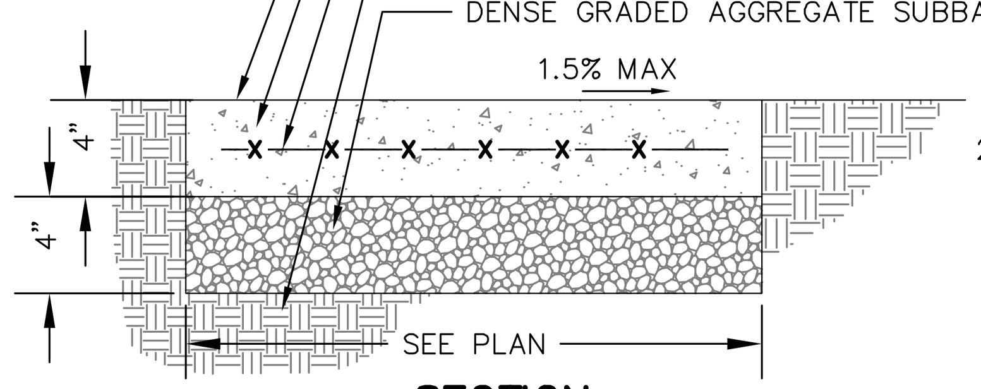
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

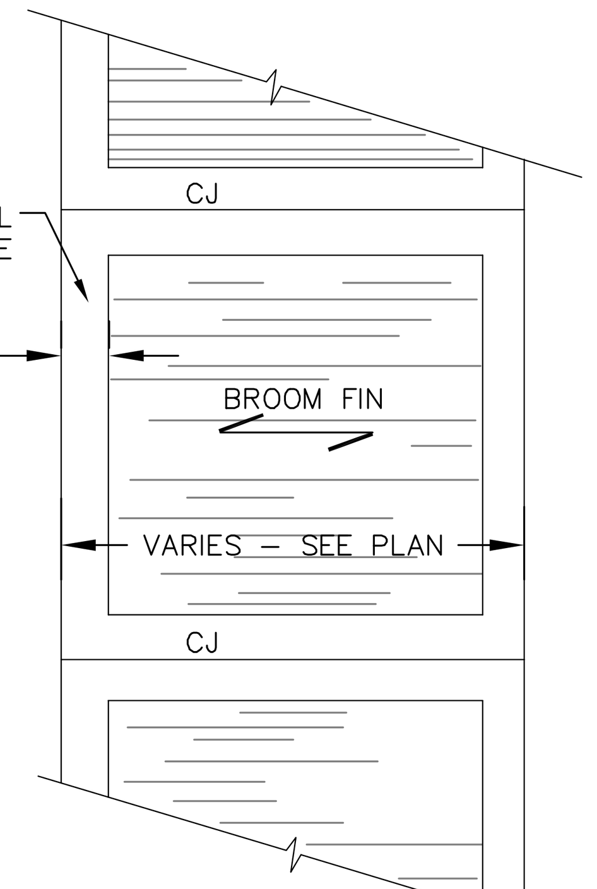
SOIL EROSION AND SEDIMENT CONTROL DETAILS AND NOTES

PROJECT NO.: 03009-003		DRAWN BY: AM
SCALE:	AS SHOWN	CHECKED BY: PAR
DATE:	11-30-2020	SHEET OF
SHEET NO.		C-9



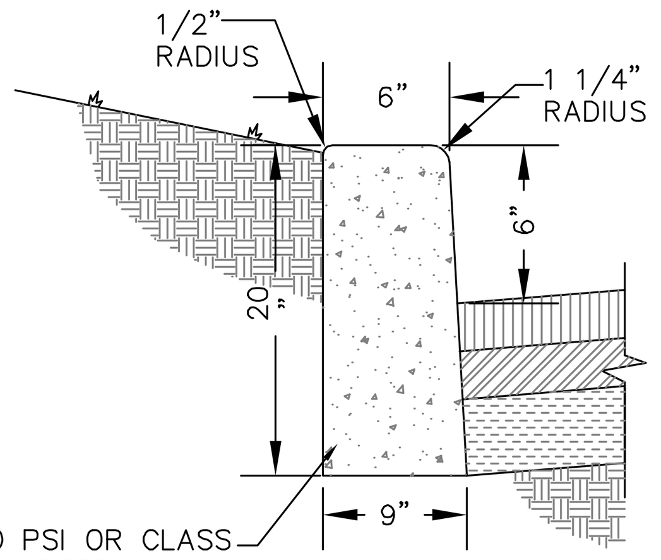
SECTION

NOTES:
1. TRANSVERSE JOINTS ½" WIDE SHALL BE INSTALLED IN THE CONCRETE 20'-0" APART AND SHALL BE FILLED WITH PREFORMED BITUMINOUS FIBER JOINT FILLER RECESSED ¼".
2. CONTRACTION JOINTS 4' o.c. (⅜"W x ⅜"D GROOVE).
3. SEE SITE PLANS FOR SCORING PATTERN.
4. PROVIDE 6" X 6" W1.4 X W1.4 WELDED WIRE MESH, CONTINUOUS BETWEEN CONTRACTION JOINTS AT ALL DRIVEWAYS.
5. SIDEWALK TO BE CONSTRUCTED AS PER THE CITY OF ELIZABETH REQUIREMENTS



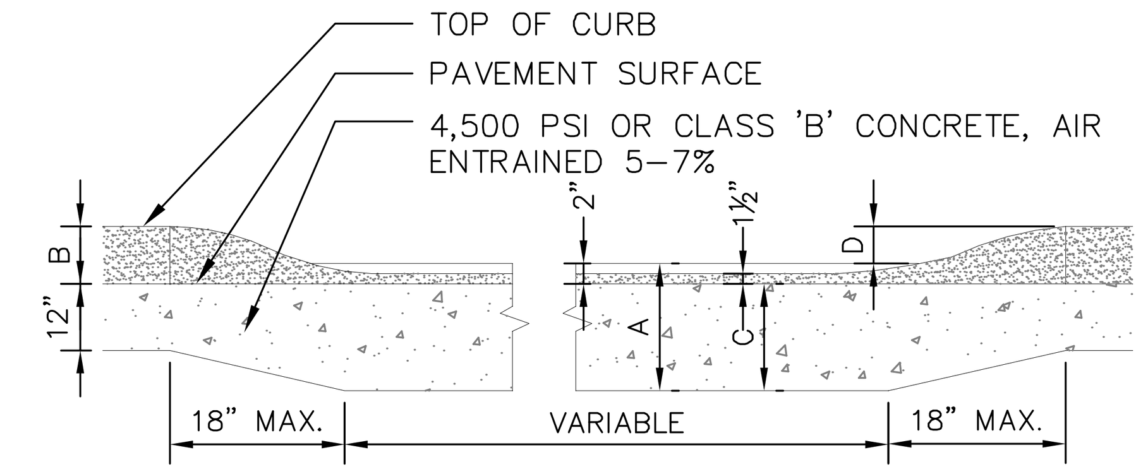
PLAN

CONCRETE SIDEWALK DETAIL
NOT TO SCALE

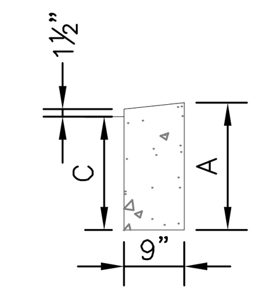


NOTES:
1. TRANSVERSE JOINTS 1/2" WIDE SHALL BE INSTALLED IN CURB 20'-0" APART & SHALL BE FILLED WITH PREFORMED BITUMINOUS- IMPREGNATED FIBER JOINT FILLER, COMPLYING WITH THE REQUIREMENTS OF ASTM D 1751-83, RECESSED 1/4" IN FROM THE FRONT FACE AND TOP OF CURB.
2. CONTRACTION JOINTS SHALL BE PROVIDED EVERY 10 FEET.

CONCRETE CURB DETAIL
NOT TO SCALE



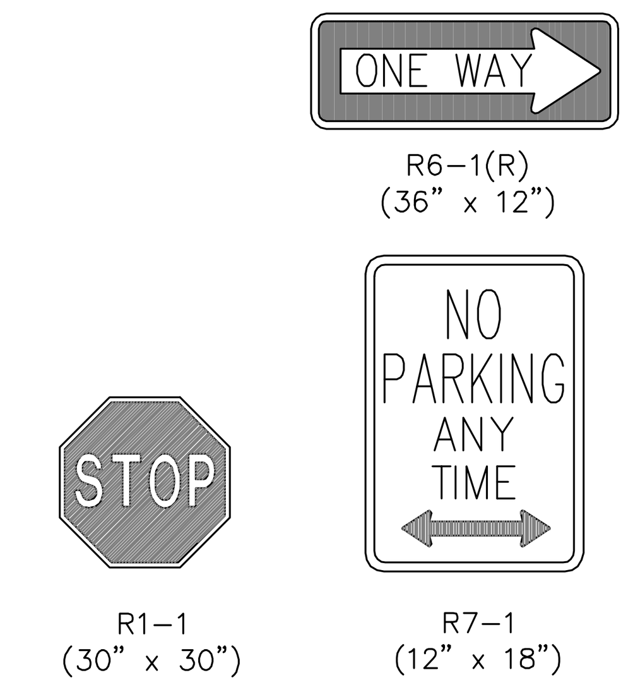
ELEVATION
N.T.S.



SECTION
N.T.S.

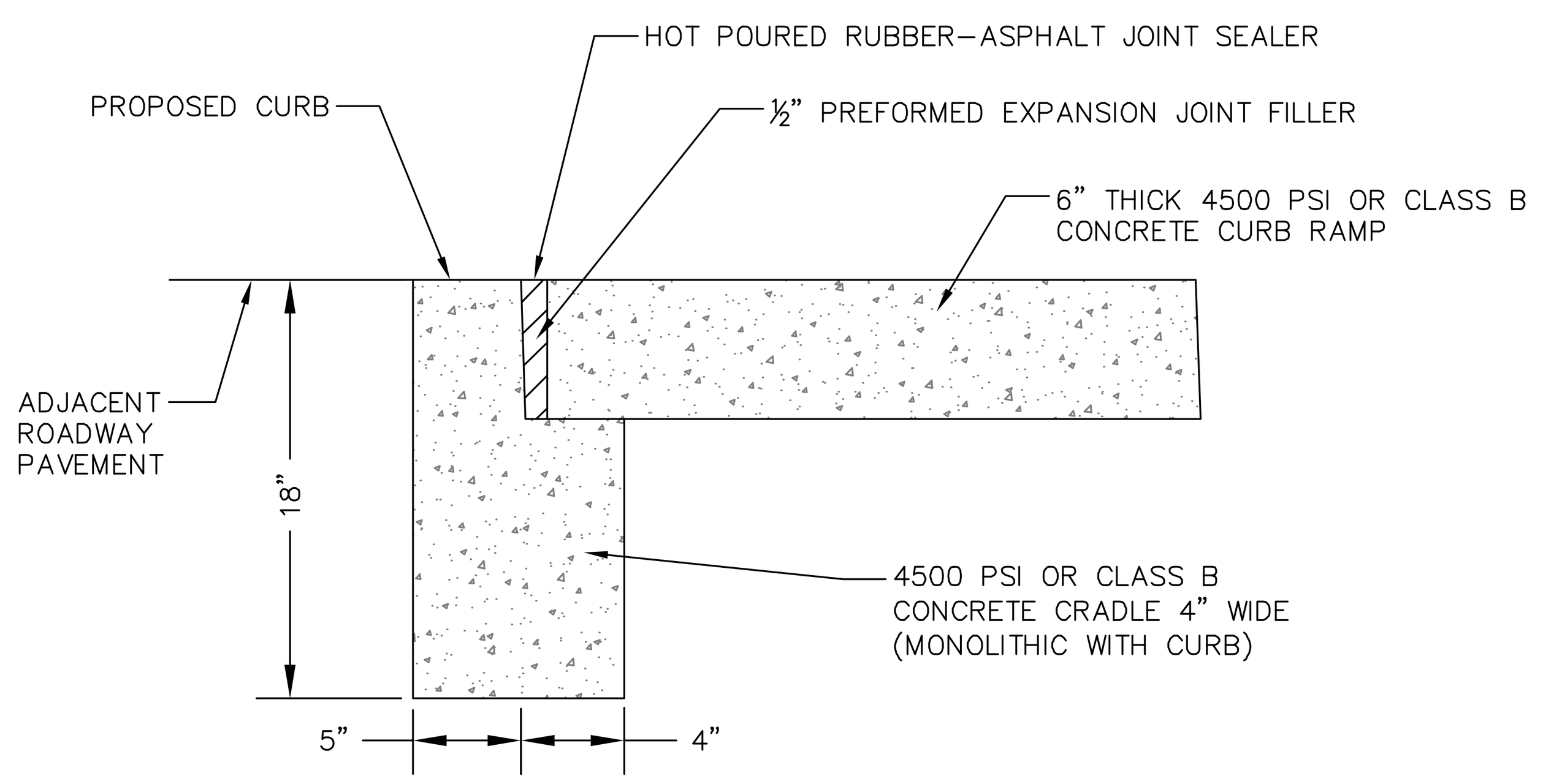
CURB SIZE	DIM. A	DIM. B	DIM. C	DIM. D
9"x16"	16"	4"	14"	2"
9"x18"	18"	6"	16"	4"
9"x20"	20"	18"	16"	4"

METHOD OF DEPRESSSING CURB AT DRIVEWAYS
NOT TO SCALE

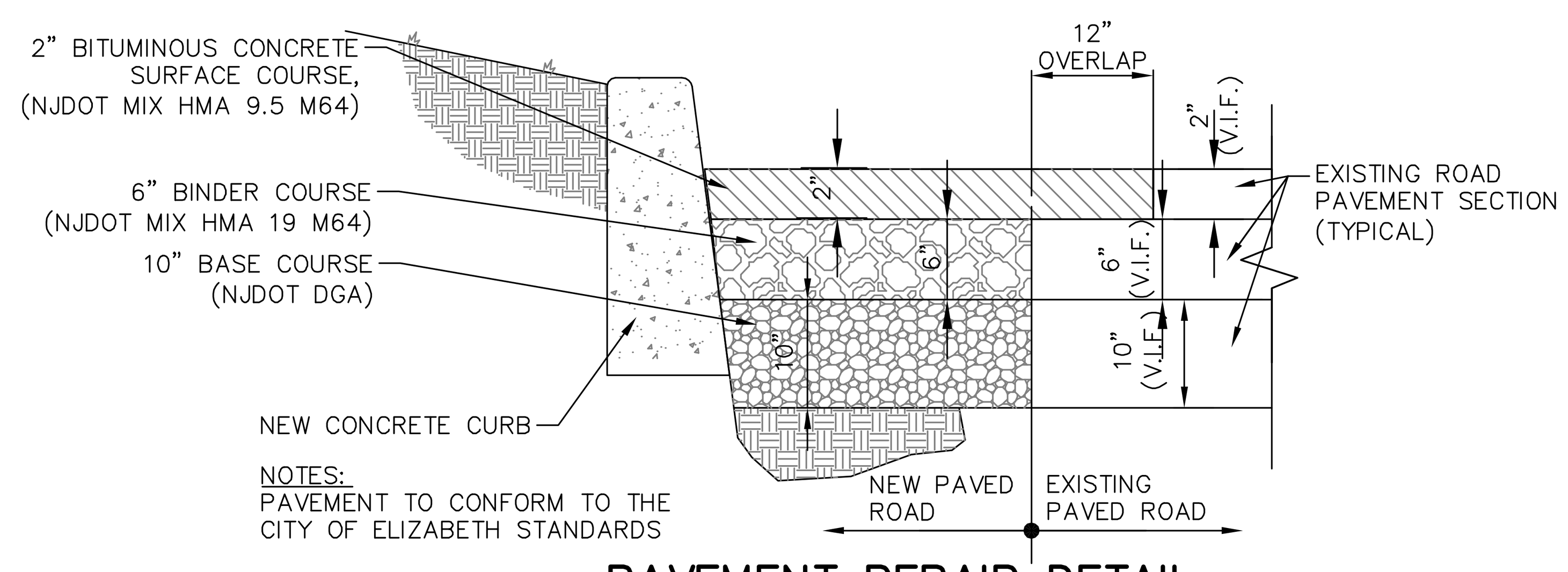


NOTES:
1. ALL SIGN MATERIALS, TEXT AND INSTALLATION GUIDELINES SHALL CONFORM TO THE "UNIFORM MANUAL OF TRAFFIC CONTROL DEVICES".
2. PROVIDE "VAN ACCESSIBLE" TEXT WHERE (V) IS NOTED ON PLANS

SITE SIGNAGE
NOT TO SCALE

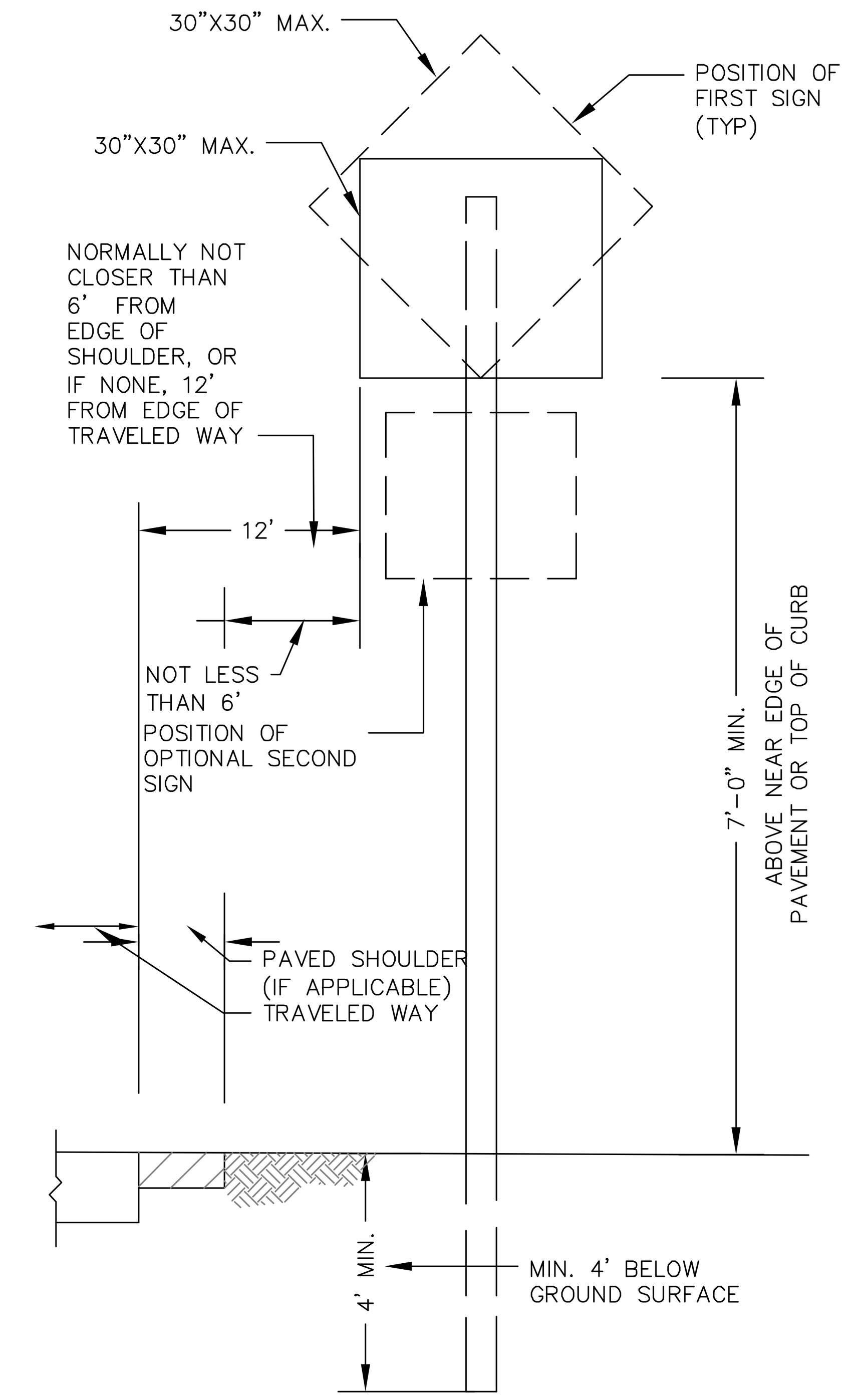


FLUSH CONCRETE CURB AND CRADLE
NOT TO SCALE



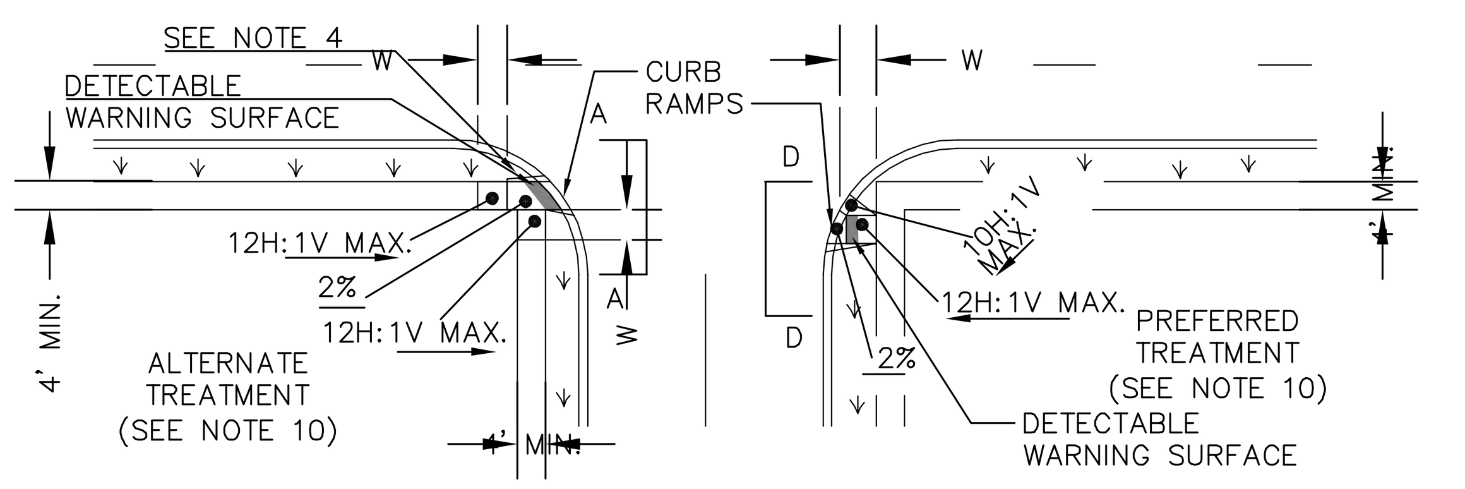
NOTES:
PAVEMENT TO CONFORM TO THE CITY OF ELIZABETH STANDARDS

PAVEMENT REPAIR DETAIL
(IF REQUIRED)
NOT TO SCALE

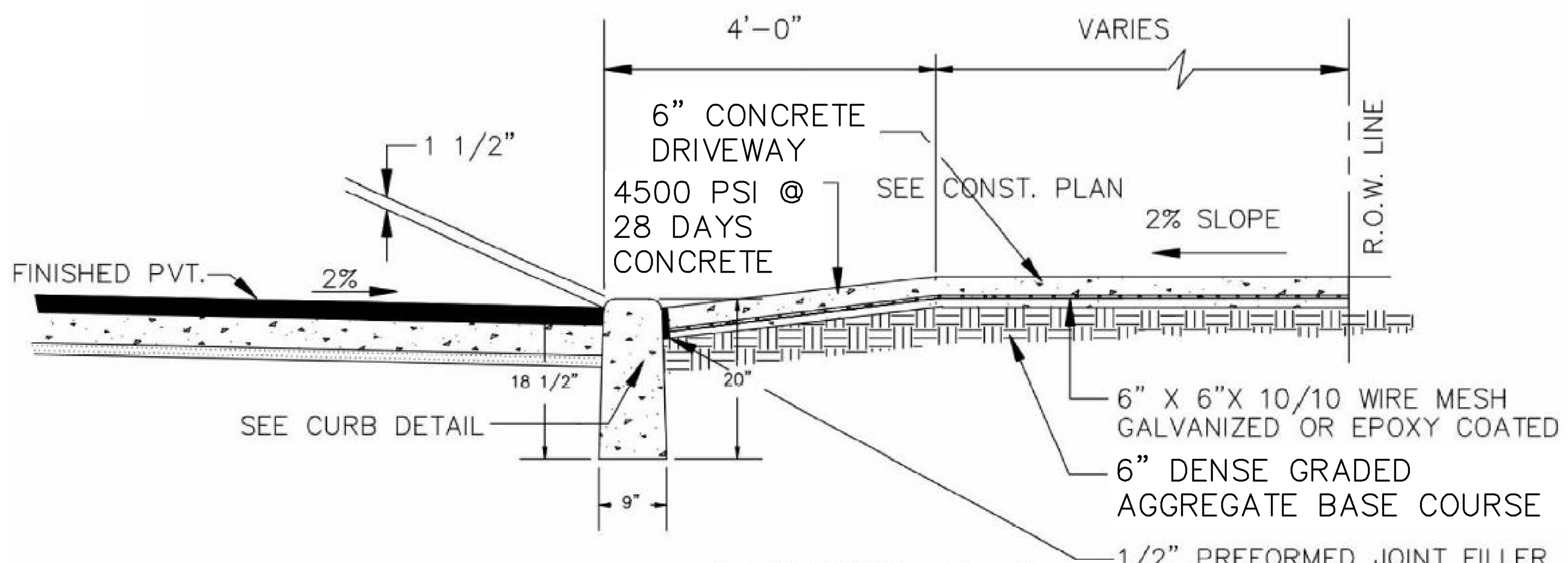


NOTE:
1. ALL SIGN PARAMETERS TO CONFORM TO THE CURRENT "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS."
2. ALL POSTS SHALL BE OF ADEQUATE LENGTH TO MEET THE REQUIREMENTS FOR ERECTION AS STATED IN THE CURRENT "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS".
3. ALL POSTS SHALL BE EMBEDDED 4' MINIMUM.
4. ALL STREET POSTS AND BRACKETS SHALL BE CUT, BENT AND HOLES PUNCHED AND DRILLED BEFORE GALVANIZING. GALVANIZING SHALL BE IN CONFORMANCE WITH CURRENT A.S.T.M. SPECIFICATION A123.
5. POSTS MAY BE STEEL, ALUMINUM OR 2 PIECE U-POST IN CONFORMANCE WITH THE NOTES BELOW.
6. SIGN PANEL SIZES SHALL DETERMINE POST TYPE AND NUMBER AS SHOWN ON THIS DETAIL AND DIRECTIONAL SIGN SHEET.
7. ADJACENT STEEL POSTS SHALL NOT BE CLOSER THAN 8 FT. APART. ADJACENT POSTS CLOSER THAN 8 FT. APART SHALL BE ALUMINUM OR 2 PIECE STEEL U-POSTS. NO MORE THAN 3 ALUMINUM OR 3 TWO PIECE STEEL U-POSTS WILL BE PERMITTED WITHIN 8 FT. BOLTS SHALL NOT PROTRUDE MORE THAN 1/2" BEYOND THE NUT WHEN TIGHT, BUT SHALL ENGAGE ALL THREADS IN THE NUT.
8. IN AREAS WHERE GROUND MOUNTED SIGN SUPPORTS CANNOT BE SUFFICIENTLY OFFSET FROM THE PAVEMENT EDGE, SIGN SUPPORTS SHOULD BE OF A SUITABLE BREAKAWAY OR YIELDING DESIGN. (SEE N.J.D.O.T. MANUAL).

SIGN MOUNTING DETAIL
N.T.S.

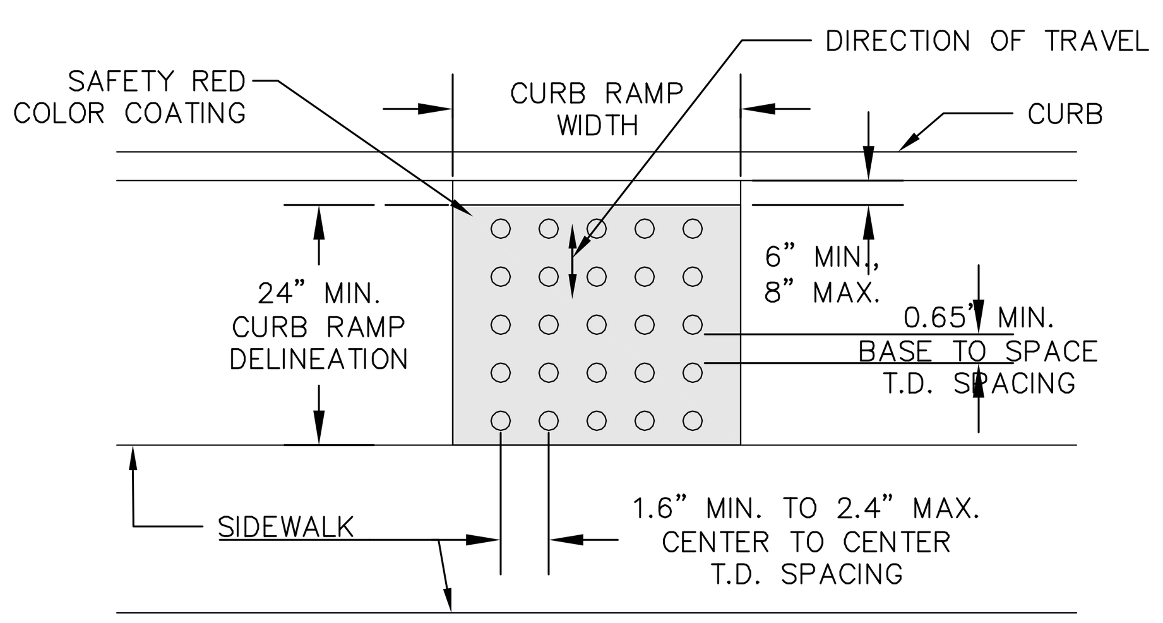


CURB RAMP TYPE 6 NOTE: SEE CURB RAMP TABLE
(CROSSING PARALLEL TO ROADWAY ONLY)
NOT TO SCALE

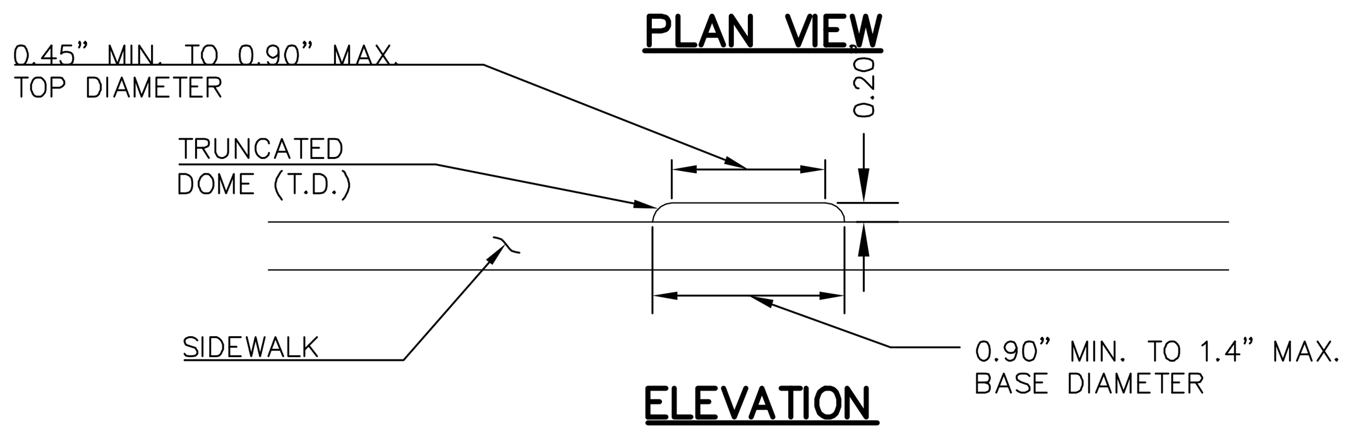


SECTION C-C

CONCRETE DRIVEWAY APRON WITH SIDEWALK DETAIL
NOT TO SCALE



PLAN VIEW

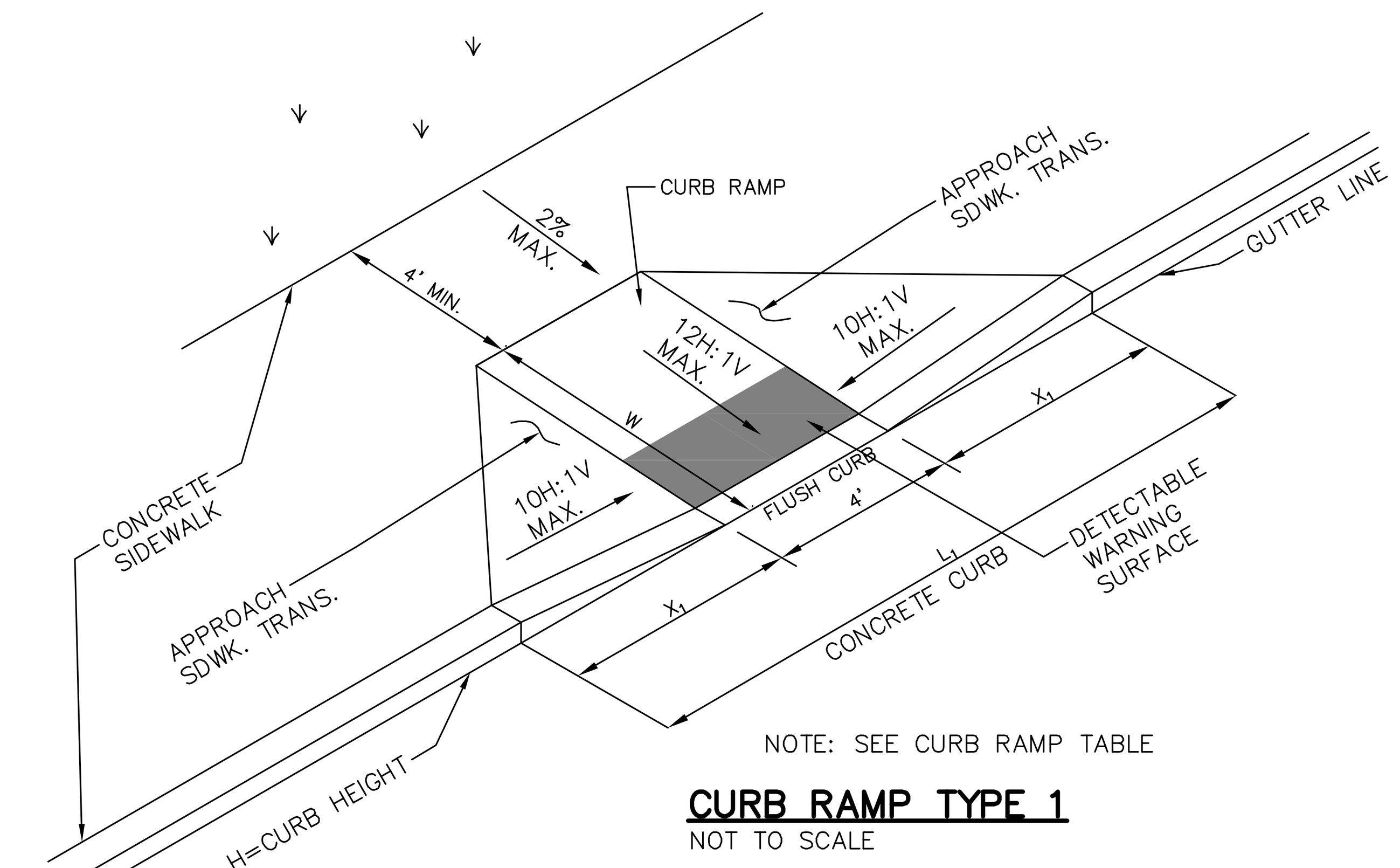


ELEVATION

DETECTABLE WARNING SURFACE

CURB RAMP TYPE 6	
H INCHES	W FEET
3	3
4	4
5	5
6	6
7	7
8	8
9	9

CURB RAMP TYPE 1			
H INCHES	X1 FEET	L1 FEET	W FEET
3	2.5	9.0	3
4	3.3	10.6	4
5	4.2	12.4	5
6	5.0	14.0	6
7	5.8	15.6	7
8	6.7	17.4	8
9	7.5	19.0	9



NOTE: SEE CURB RAMP TABLE

CURB RAMP TYPE 1
NOT TO SCALE

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

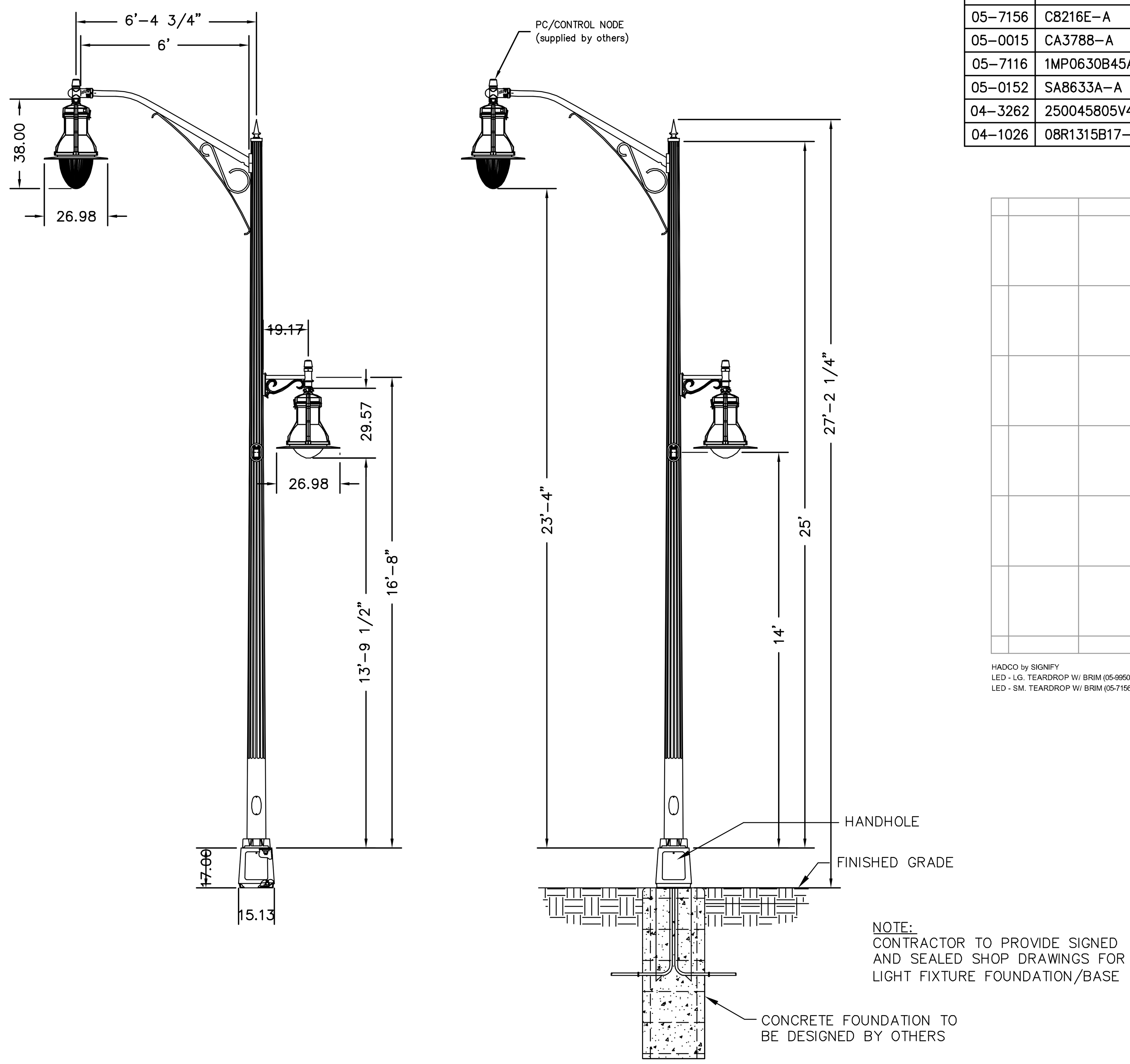
BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

SITE DETAILS

PROJECT NO.: 03009-003 DRAWN BY: AM
SCALE: AS SHOWN CHECKED BY: PAR
DATE: 11-30-2020 SHEET OF
SHEET NO.

C-10

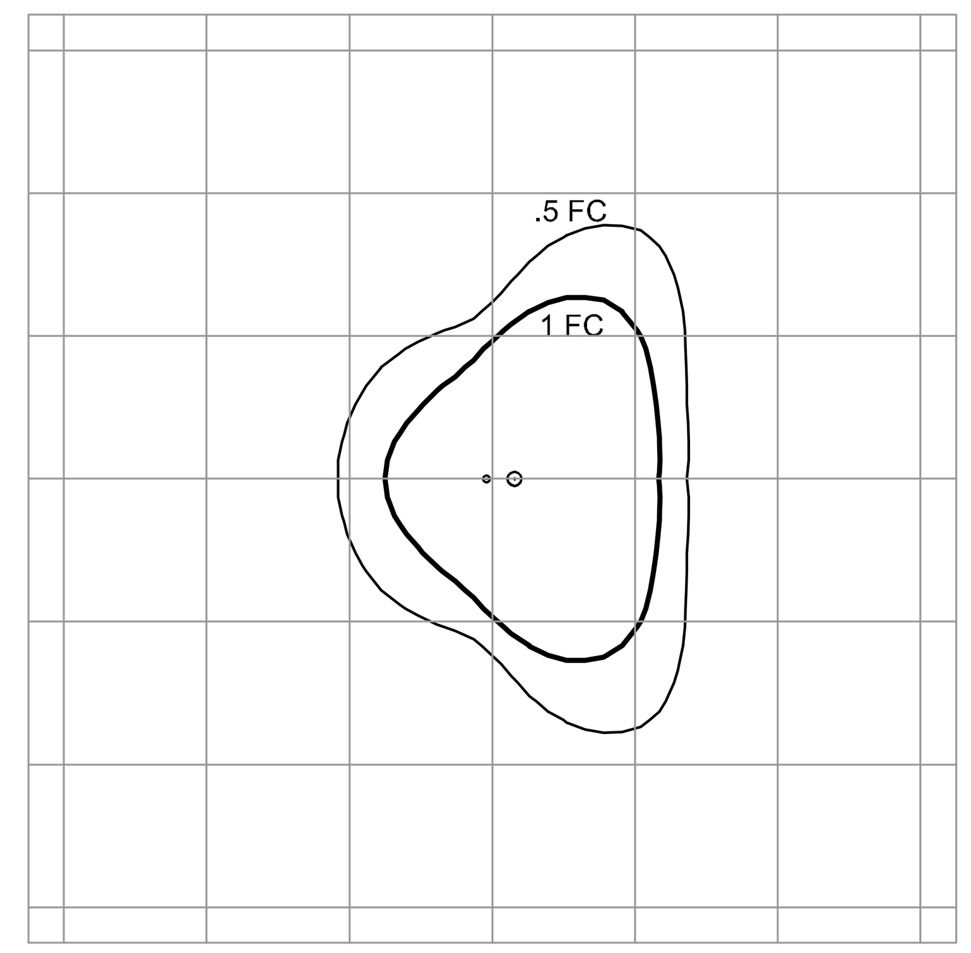


NOTE:
CONTRACTOR TO PROVIDE SIGNED AND SEALED SHOP DRAWINGS FOR LIGHT FIXTURE FOUNDATION/BASE

LIGHT FIXTURE/POLE BASE DETAIL

NOT TO SCALE

C/C	HADCO #	DESCRIPTION
05–9950	C8214J–A	Large Teardrop w/ Brim, 80 LED, T3, Black
05–7156	C8216E–A	Small Teardrop w/ Brim, 32 LED, T5, Black
05–0015	CA3788–A	Arm Adaptor, Black
05–7116	1MP0630B45A	Bloomfield Arm, 6ft, Black
05–0152	SA8633A–A	Colonial Pendent Bracket, Black
04–3262	250045805V4D	Tall Fluted Deco Pole, 25ft, Black
04–1026	08R1315B17–DBL	Transformer Base, TB1–17, Black



HADCO by SIGNIFY
LED - LG. TEARDROP W/ BRIM (05-9950)
LED - SM. TEARDROP W/ BRIM (05-7156)

Horizontal Footcandles
Light Loss Factor = 0.85

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.

3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700

CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PAULUS, SOKOLOWSKI AND SARTOR, LLC. OF ANY CONFLICTS, ERRORS, AMBIGUITIES OR DISCREPANCIES IN THE CONTRACT DRAWINGS OR SPECIFICATIONS BEFORE PROCEEDING WITH CONSTRUCTION.

ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS.

THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE NOTED PROJECT AND CLIENT. THEY ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR REUSE ON ANY OTHER PROJECT.

UNLESS THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION ISSUE", THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR IMPROVEMENTS DEPICTED HEREIN, CONTRACTORS SHALL NOTIFY THE DESIGN ENGINEER TO OBTAIN CONSTRUCTION DOCUMENTS.

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

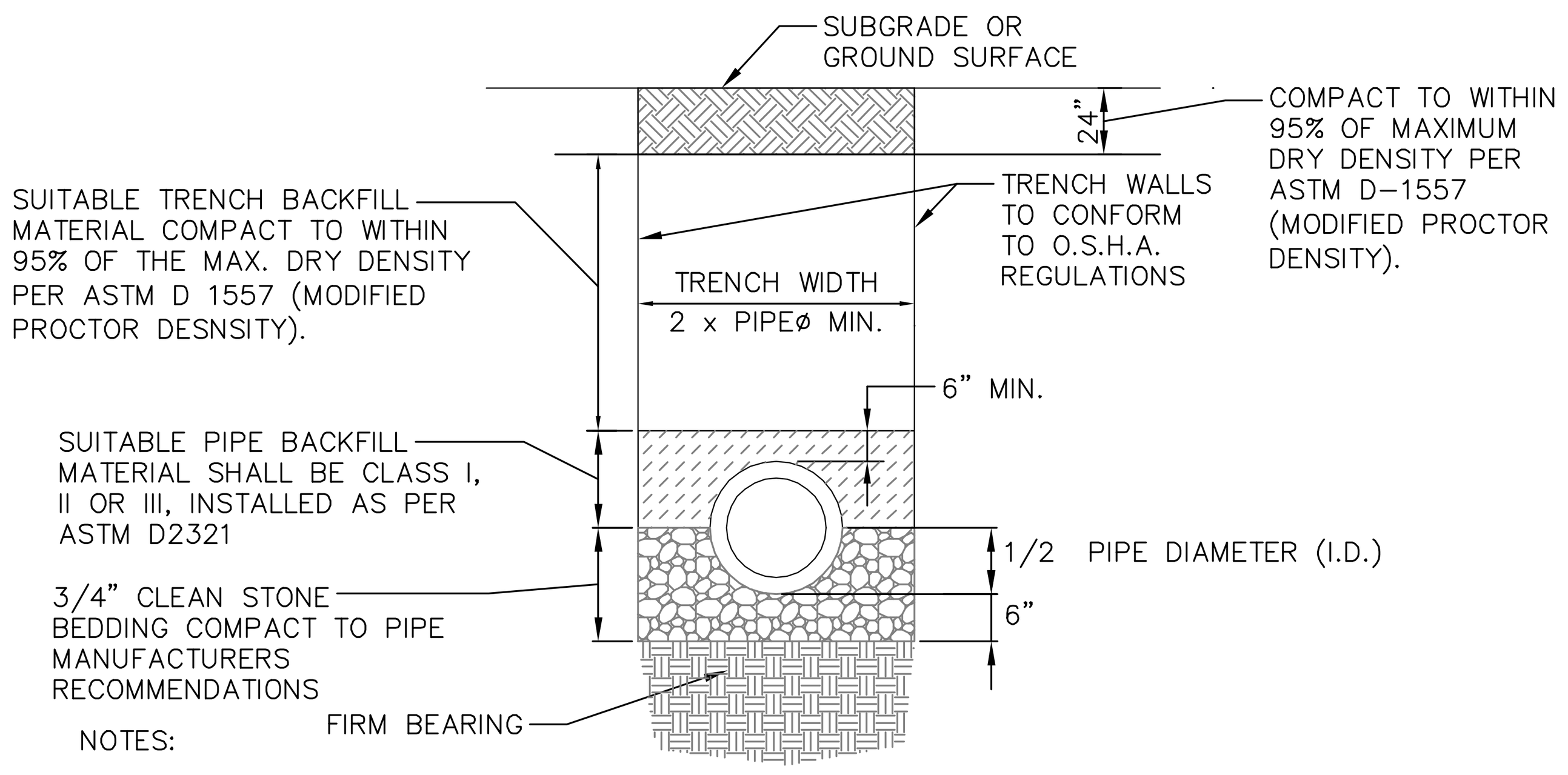
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

LIGHTING DETAILS

PROJECT NO.: 03009-003	DRAWN BY: AM
SCALE: AS SHOWN	CHECKED BY: PAR
DATE: 11-30-2020	SHEET OF
SHEET NO. C-11	

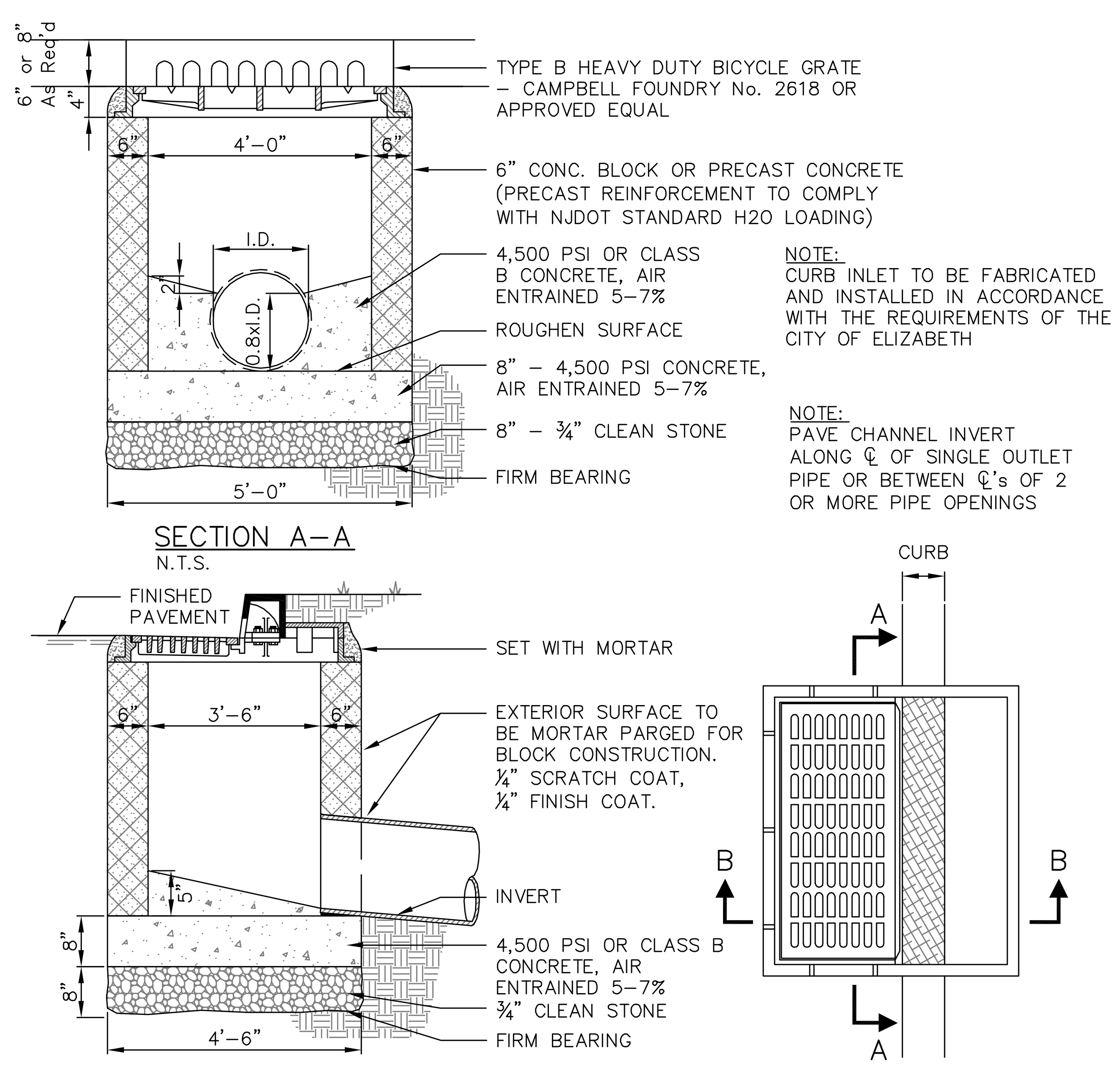


NOTES:

1. TRENCH WIDTH SHALL BE A MINIMUM OF 1.5' EACH SIDE PLUS THE OUTSIDE DIAMETER OF THE PIPE. TRENCH WIDTH SHALL NOT EXCEED THAT REQUIRED FOR PROPER INSTALLATION BACKFILL AND COMPACTION OPERATIONS.
2. ALL SUITABLE BACKFILL AND SAND BEDDING SHALL BE AS PER SPECIFICATIONS AND APPROVED BY THE RESIDENT ENGINEER PRIOR TO INSTALLATION.
3. IN LIEU OF ¾" CLEAN STONE FOR PIPE BEDDING, SAND MAY BE UTILIZED FOR PVC AND HDPE PIPE BEDDING.
4. COMPACTION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

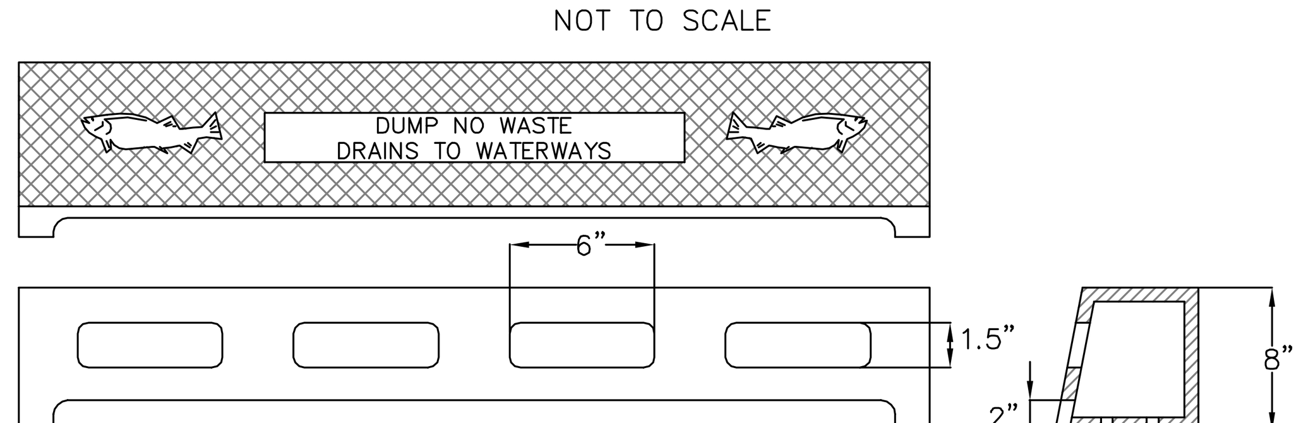
STORM SEWER PIPE BEDDING DETAIL

NOT TO SCALE



CURB INLET DETAIL

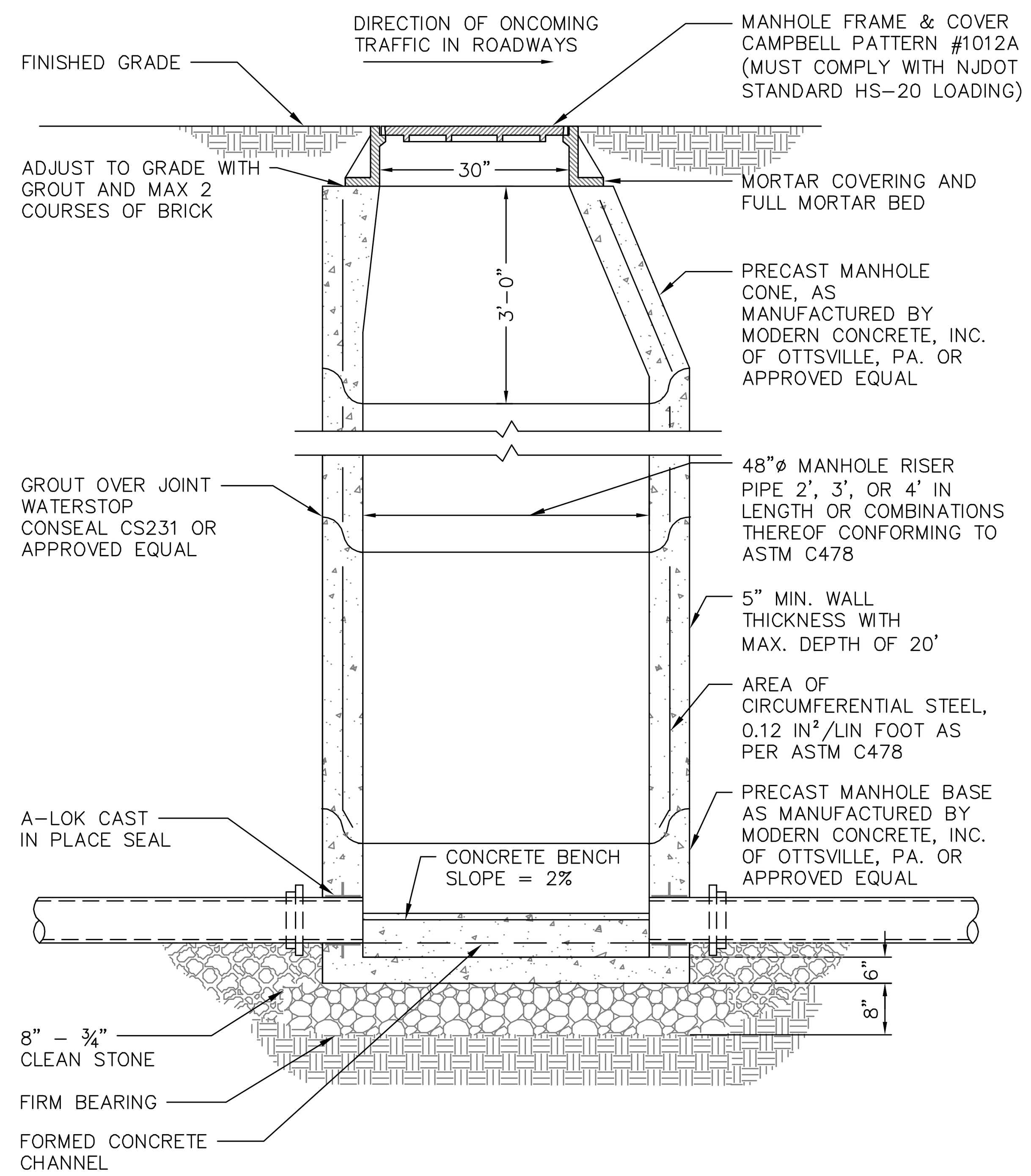
NOT TO SCALE



NOTE:
1. MATERIAL: GRAY CAST IRON ASTM A48-83, CLASS 30B

CURB PIECE TYPE 'N' ECO DETAIL

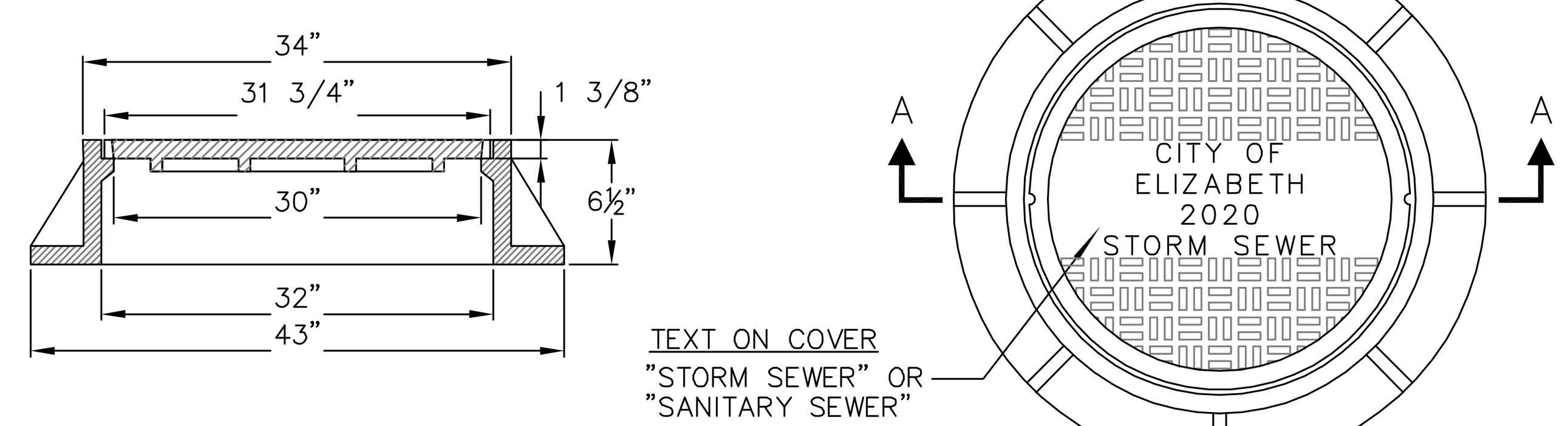
NOT TO SCALE



STORM SEWER MANHOLE

(IF AND WHERE DIRECTED)

NOT TO SCALE



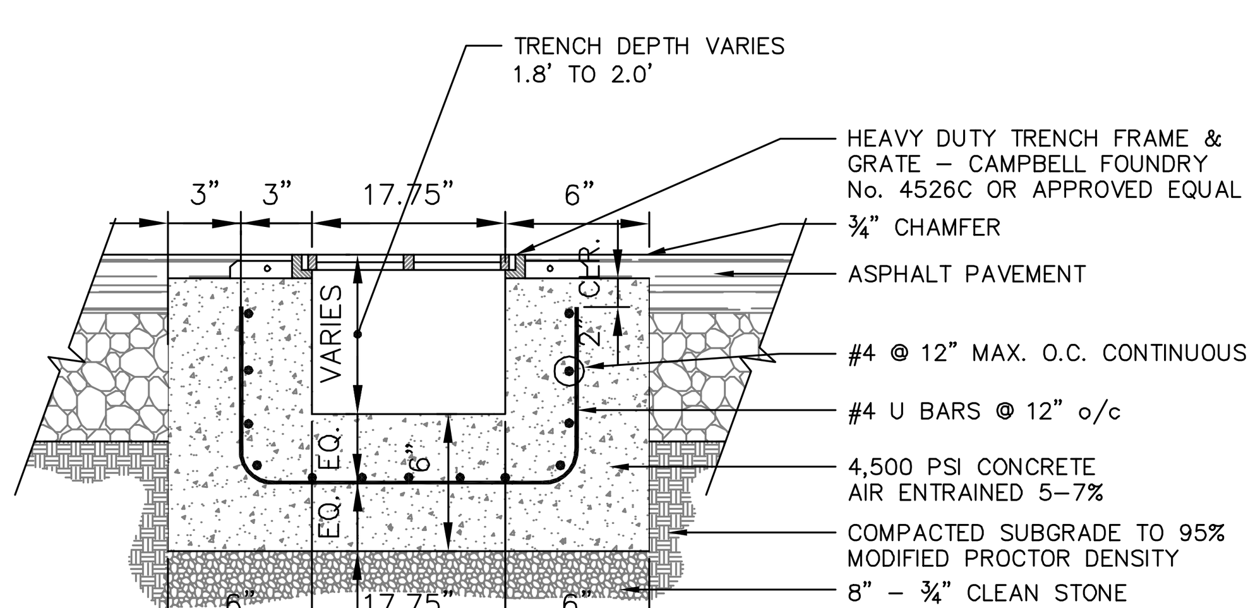
SECTION A–A

SECTIONAL PLAN

NOTE:
1. MH FRAME AND COVER SHALL BE CAMPBELL FOUNDRY PATTERN #1012A (OR APPROVED EQUAL)

STANDARD MANHOLE COVER & FRAME DETAIL

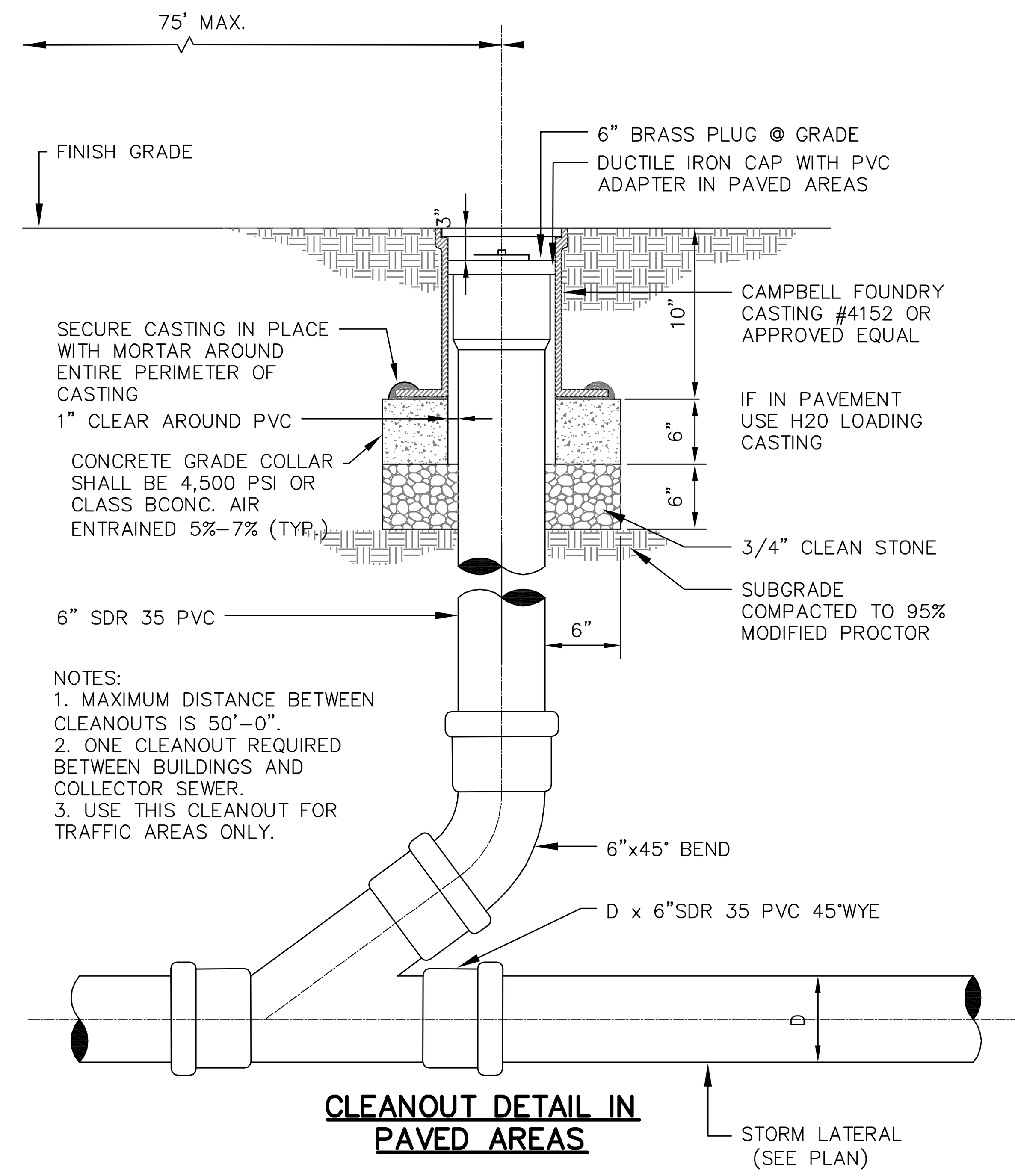
NOT TO SCALE



NOTE:
CONCRETE CURB MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH N.J.D.O.T. SPECIFICATIONS SECTION 603.

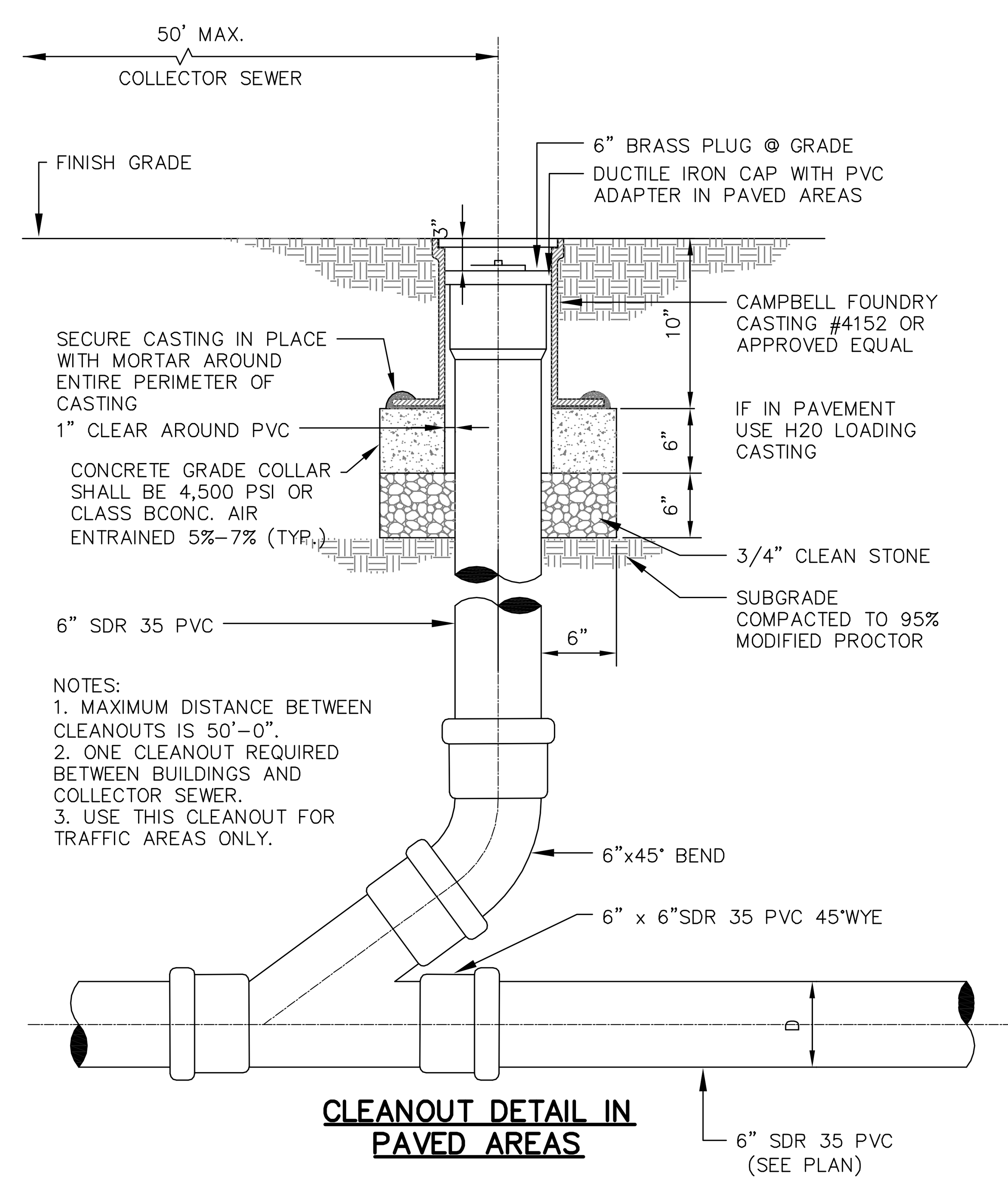
TRENCH DRAIN DETAIL (IF REQUIRED)

NOT TO SCALE



ROOF DRAIN CLEANOUT DETAIL

NOT TO SCALE



SANITARY CLEANOUT DETAIL

NOT TO SCALE

REV. / ISSUE	DATE	DESCRIPTION
1	01/11/21	ISSUED FOR CITY OF ELIZABETH COURTESY REVIEW
2	04/30/21	REVISED BUILDING FOOTPRINT/ PROGRESS REVIEW
3	06/04/21	ISSUED FOR BIDDING
4	07/28/21	ISSUED FOR BIDDING

CONSULTANT

ORIENTATION / KEY PLAN

CLIENT

PAULUS, SOKOLOWSKI AND SARTOR, LLC.
3 MOUNTAINVIEW ROAD
P.O. BOX 4039
WARREN, NJ 07059
PHONE: (732) 560-9700
CERTIFICATE OF AUTHORIZATION NO. 24GA28032700

PATRICIA A. RUSKAN, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. NO. 42016

SIGNATURE DATE

PROJECT

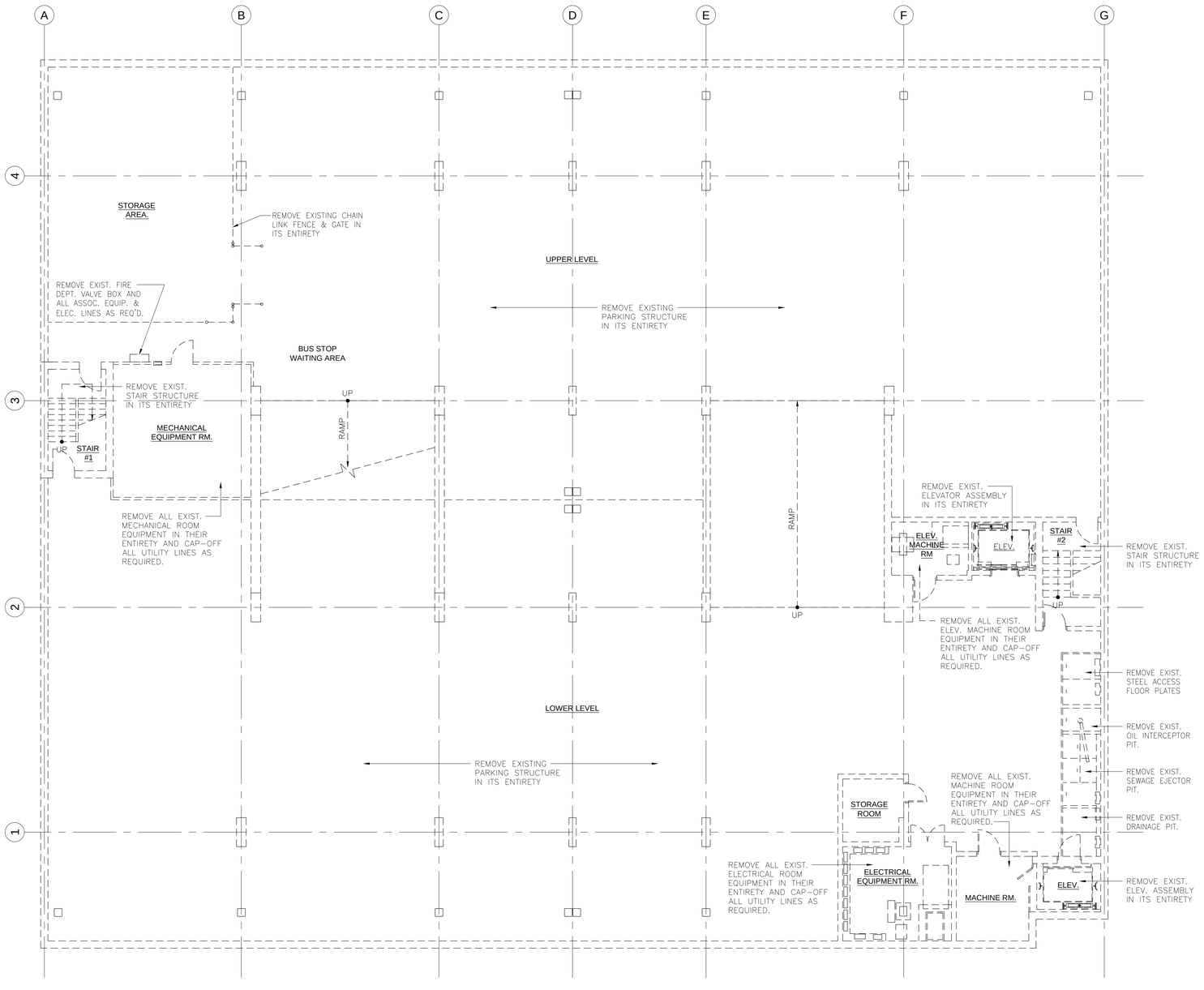
PARKING DECK
UNION COUNTY
JUSTICE COMPLEX

BLOCK 6 LOT 42, 42A, 1366, 1367 & 91
CITY OF ELIZABETH, NEW JERSEY

SHEET TITLE

UTILITY DETAILS

PROJECT NO.: 03009-003	DRAWN BY: AM
SCALE: AS SHOWN	CHECKED BY: PAR
DATE: 11-30-2020	SHEET OF
SHEET NO. C-12	



BASEMENT DEMOLITION PLAN

AD-100

SCALE: 1/8"=1'-0"

DEMOLITION NOTES

1. THE UNION COUNTY PARKING DECK BUILDING AT THE CORNER OF CALDWELL PLACE AND ELIZABETHTOWN PLAZA, ELIZABETH, NJ 07202 SHALL BE DEMOLISHED IN ITS ENTIRETY. THE DEMOLITION SHALL INCLUDE THE FOLLOWING: THE BASEMENT AND THE FIRST THROUGH THE SEVENTH FLOOR STRUCTURES, INCLUDING FOUNDATIONS AND FOOTINGS, SLABS, WALLS, COLUMNS, STAIRS, ETC. DEMOLISH THE BASEMENT FOUNDATION WALLS, CONCRETE FLOOR SLABS AND FOOTINGS. REMOVE ALL LANDSCAPING, CONCRETE SIDEWALKS, PAVEMENT, ETC. AS REQUIRED TO FACILITATE THE DEMOLITION WORK.
2. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO START OF EXCAVATION AND DEMOLITION WORK. ALL DEMOLITION OPERATIONS SHALL BE COORDINATED WITH THE APPLICABLE UTILITY COMPANY WHERE REQUIRED. ALL EXISTING UTILITY CONNECTIONS SHALL BE DISCONNECTED AND CAPPED PRIOR TO COMMENCING ANY DEMOLITION WORK.
3. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED DEMOLITION PERMITS REQUIRED BY FEDERAL, STATE, AND LOCAL JURISDICTIONS FOR ALL PHASES AND OPERATIONS PRIOR TO BEGINNING OF ANY WORK. THE BUILDING SHALL BE VACATED PRIOR TO COMMENCING DEMOLITION.
4. THE CONTRACTOR SHALL CAREFULLY MAKE ALL INVESTIGATIONS IN THE FIELD PRIOR TO SUBMITTING THEIR BIDS. JOBSITE INSPECTION SHALL BE CONDUCTED TO EXAMINE EXISTING CONDITIONS, TO DETERMINE NATURE AND SCOPE OF WORK OR ANY DIFFICULTIES THAT MIGHT ARISE AT TIME OF WORK. THEIR BID SHALL REFLECT ALL WORK NECESSARY FOR THE COMPLETE DEMOLITION OF EXISTING STRUCTURE AS SPECIFIED IN THIS CONTRACT.
5. THE CONTRACTOR IS TO PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT TO PERFORM A COMPLETE JOB. THE CONTRACTOR SHALL SUBMIT A DEMOLITION PLAN, WITH PROPOSED PHASING, TO THE ARCHITECT & OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK. THE PLAN SHALL INCLUDE A SCHEDULE OF DEMOLITION ACTIVITIES, DETAILED COORDINATION OF UTILITIES SHUTOFFS AND MATERIALS STAGING AREAS.
6. ALL DAMAGES TO EXISTING ADJACENT STRUCTURE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR SUCH DAMAGES AT THEIR OWN EXPENSE.
7. DEMOLITION PLAN SHOWS APPROXIMATE LAYOUT OF EXISTING PARTITIONS AND ARE NOT INTENDED TO REPRESENT "AS BUILT" CONDITIONS. ALL INFORMATION MUST BE VERIFIED ON SITE.
8. PRIOR TO DEMOLITION AND REMOVALS, ALL UTILITIES AND APPURTENANCES INCLUDING GAS, WATER SANITARY, STORM WATER, ELECTRIC, TELEPHONE, CABLE, ETC. ARE TO BE REMOVED AND CAPPED AT THE LIMITS OF THE DEMOLITION (PROPERTY LIMITS) UNLESS OTHERWISE NOTED.
9. UNLESS OTHERWISE INDICATED, DEMOLITION WASTE BECOMES PROPERTY OF THE CONTRACTOR. HISTORIC ITEMS, RELICS, ANTIQUES, AND SIMILAR OBJECTS INCLUDING, BUT NOT LIMITED TO, CORNERSTONES AND THEIR CONTENTS, COMMEMORATIVE PLAQUES AND TABLETS, AND OTHER ITEMS OF INTEREST OR VALUE TO OWNER THAT MAY BE UNCOVERED DURING DEMOLITION REMAIN THE PROPERTY OF THE OWNER. CAREFULLY SALVAGE IN A MANNER TO PREVENT DAMAGE AND PROMPTLY RETURN TO OWNER.
10. THE CONTRACTOR SHALL DISPOSE OF ALL DEMOLITION DEBRIS IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL ORDINANCES. THE CONTRACTOR SHALL COORDINATE THE LOCATION AND TRANSPORTATION ACTIVITIES OF DUMPSTERS AND CONTAINERS WITH THE OWNER'S REPRESENTATIVE.
11. THE CONTRACTOR SHALL EXCAVATE TO FACILITATE THE REMOVAL OF ANY NEUTRALIZATION TANK AND ASSOCIATED TANK LINES BY THE HAZARDOUS REMOVAL CONTRACTOR. THE CONTRACTOR SHALL BACKFILL AFTER REMOVALS. REFER TO THE TECHNICAL SPECIFICATIONS FOR ENVIRONMENTAL REMEDIATION. BACKFILL THE AREA AND TRENCHES WITH SATISFACTORY SOIL MATERIALS, UNIFORMLY ROUGH GRADE AREA OF DEMOLISHED CONSTRUCTION TO A SMOOTH SURFACE. FREE FROM IRREGULAR SURFACE CHANGES. PROVIDE SMOOTH TRANSITION BETWEEN ADJACENT EXISTING GRADES AND NEW GRADES.
12. IF MATERIALS ARE DISCOVERED DURING DEMOLITION, THE GENERAL CONTRACTOR SHALL LEGALLY DISPOSE OF IT. THE CONTRACTOR SHALL SUBMIT RECEIPT AND ACCEPTANCE OF HAZARDOUS WASTES BY A LANDFILL FACILITY LICENSED TO ACCEPT HAZARDOUS WASTES TO THE OWNER'S REPRESENTATIVE.
13. THE BUILDING IMMEDIATELY ADJACENT TO THE DEMOLITION SHALL NOT BE DISRUPTED.
14. MAINTAIN ACCESS TO EXISTING WALKWAYS, EXITS, AND OTHER FACILITIES USED BY OCCUPANTS OF ADJACENT BUILDINGS. DO NOT CLOSE OR OBSTRUCT WALKWAYS, EXITS, OR OTHER FACILITIES USED BY OCCUPANTS OF ADJACENT BUILDINGS AND PUBLIC WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION.
15. THE CONTRACTOR TO CONDUCT BUILDING DEMOLITION AND DEBRIS-REMOVAL OPERATIONS TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS, WALKWAYS, AND OTHER ADJACENT OCCUPIED AND USED FACILITIES. DO NOT CLOSE OR OBSTRUCT STREETS, WALKS, WALKWAYS, OR OTHER ADJACENT OCCUPIED OR USED FACILITIES.
16. PROCEED WITH DEMOLITION OF STRUCTURAL FRAMING MEMBERS SYSTEMATICALLY, FROM HIGHER TO LOWER LEVEL. COMPLETE BUILDING DEMOLITION OPERATIONS ABOVE EACH FLOOR OR TIER BEFORE DISTURBING SUPPORTING MEMBERS ON THE NEXT LOWER LEVEL. REMOVE DEBRIS FROM ELEVATED PORTIONS OF THE BUILDING BY CHUTE, HOIST, OR OTHER DEVICE THAT WILL CONVEY DEBRIS TO GRADE LEVEL IN A CONTROLLED DESCENT. REMOVE STRUCTURAL FRAMING MEMBERS AND LOWER TO GROUND BY METHOD SUITABLE TO MINIMIZE GROUND IMPACT AND DUST GENERATION.
DEMOLISH AND REMOVE EXISTING UTILITIES AND BELOW-GRADE UTILITY STRUCTURES, AND PERMANENTLY CAP & SEAL ALL UTILITIES TO REMAIN IN PLACE.
17. COMPLETELY FILL BELOW-GRADE AREAS AND VOIDS RESULTING FROM BUILDING DEMOLITION OPERATION WITH SATISFACTORY SOIL MATERIALS. UNIFORMLY ROUGH GRADE AREA OF DEMOLISHED CONSTRUCTION TO A SMOOTH SURFACE. FREE FROM IRREGULAR SURFACE CHANGES. PROVIDE SMOOTH TRANSITION BETWEEN ADJACENT EXISTING GRADES AND NEW GRADES.
18. THE CONTRACTOR SHALL CONSPICUOUSLY LOCATE SIGNAGE TO INDICATE THE LOCATION OF DEMOLITION AREAS. THE SIGNAGE WILL CONSIST OF 2" TALL BLACK LETTERING ON AN ORANGE BACKGROUND AND WILL READ AS FOLLOWS: "KEEP OUT CONSTRUCTION AREA CONTRACTOR EMPLOYEES ONLY".
19. REMOVE ALL EXISTING CONCRETE STEPS, RAMPS AND RAILINGS IN THEIR ENTIRELY.
21. DASHED LINES INDICATE ITEMS TO BE REMOVED. THESE IDENTIFIED ITEMS DO NOT RELIEVE THE CONTRACTOR AND ANY ADDITIONAL WORK OF SIMILAR SCOPE AND NATURE IDENTIFIED THROUGH FIELD INVESTIGATIONS.
22. THE CONTRACTOR TO INSTALL TEMPORARY CHAIN-LINK FENCE, IN 6' HEIGHT, AS INDICATED IN SPECIFICATION SECTION 015000, TO ENCLOSE AND SECURE THE PROJECT SITE. PROVIDE GATES AT CONSTRUCTION ENTRANCES.
23. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNER'S REPRESENTATIVE & ARCHITECT OF ANY POTENTIAL PROBLEMS THAT MAY INTERFERE WITH THE WORK PRIOR TO STARTING CONSTRUCTION.
24. AT ALL LOCATIONS OF UNDERGROUND DEMOLITION, CONTRACTOR SHALL DESIGN, PROVIDE, MONITOR AND MAINTAIN EXCAVATION SUPPORT AND PROTECTION SYSTEMS CAPABLE OF SUPPORTING EXCAVATING SIDEWALLS, AND OF RESISTING SOIL AND HYDROSTATIC PRESSURE AND SUPERIMPOSED AND CONSTRUCTION LOADS TYPICAL.
25. THE DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO CONCRETE, MASONRY, LUMBER, WALLS, ROOF, FLOORING, FLOOR COVERINGS, WINDOWS, DOORS, MILLWORK/CASEWORK, PLUMBING FIXTURES AND PIPING, ALL AMENITIES INCLUDING FURNITURE, APPLIANCES, FUME HOODS, HVAC EQUIPMENT AND DUCTWORK, ELECTRICAL EQUIPMENT, CONDUITS, LIGHTING, ETC.
26. EXCAVATE AND REMOVE ALL UNDERGROUND ELECTRICAL LINES THAT CONNECT TO THE BUILDING AS REQUIRED. BACKFILL THE TRENCHES WITH SATISFACTORY SOIL MATERIALS. UNIFORMLY ROUGH GRADE AREA OF DEMOLISHED CONSTRUCTION TO A SMOOTH SURFACE. FREE FROM IRREGULAR SURFACE CHANGES. PROVIDE SMOOTH TRANSITION BETWEEN ADJACENT EXISTING GRADES AND NEW GRADES.
27. EXCAVATED MATERIAL SHALL BE REDIRECTED ON-SITE AND PROPERLY GRADED OR LEGALLY REMOVED OFF-SITE TO A DISPOSAL AREA, AT THE CONTRACTOR'S EXPENSE. MATERIAL REMOVAL OFF-SITE SHALL BE PROPERLY DOCUMENTED AND MANIFESTED.
28. NEW WATER SERVICE ROOM IN ANNEX BUILDING AND ALL ASSOCIATED WORK SHALL BE COMPLETED PRIOR TO DEMOLITION OF THE SKY BRIDGE AND PARKING GARAGE.
29. REMOVE ALL ROOFTOP UNITS/EQUIPMENT INCLUDING ALL ASSOCIATED UTILITY LINES IN THEIR ENTIRETY.

HAZARDOUS MATERIAL NOTE:

PRIOR TO ANY BUILDING DEMOLITION, ALL HAZARDOUS MATERIALS INCLUDING ASSOCIATED ASBESTOS LEAD BASED PAINT, UNIVERSAL WASTE AND HEAVY METALS SHALL BE REMOVED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND ALL APPLICABLE LAWS, RULES, ORDINANCES, REGULATIONS AND STANDARDS. ASBESTOS MUST BE REMOVED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR. CONTRACTOR SHALL REFER TO THE PROJECT SPECIFICATIONS FOR THE PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT, PREPARED BY OMEGA ENVIRONMENTAL, INC. DATE OF REPORT: 10/20/2020.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.277.2606
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BASEMENT DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

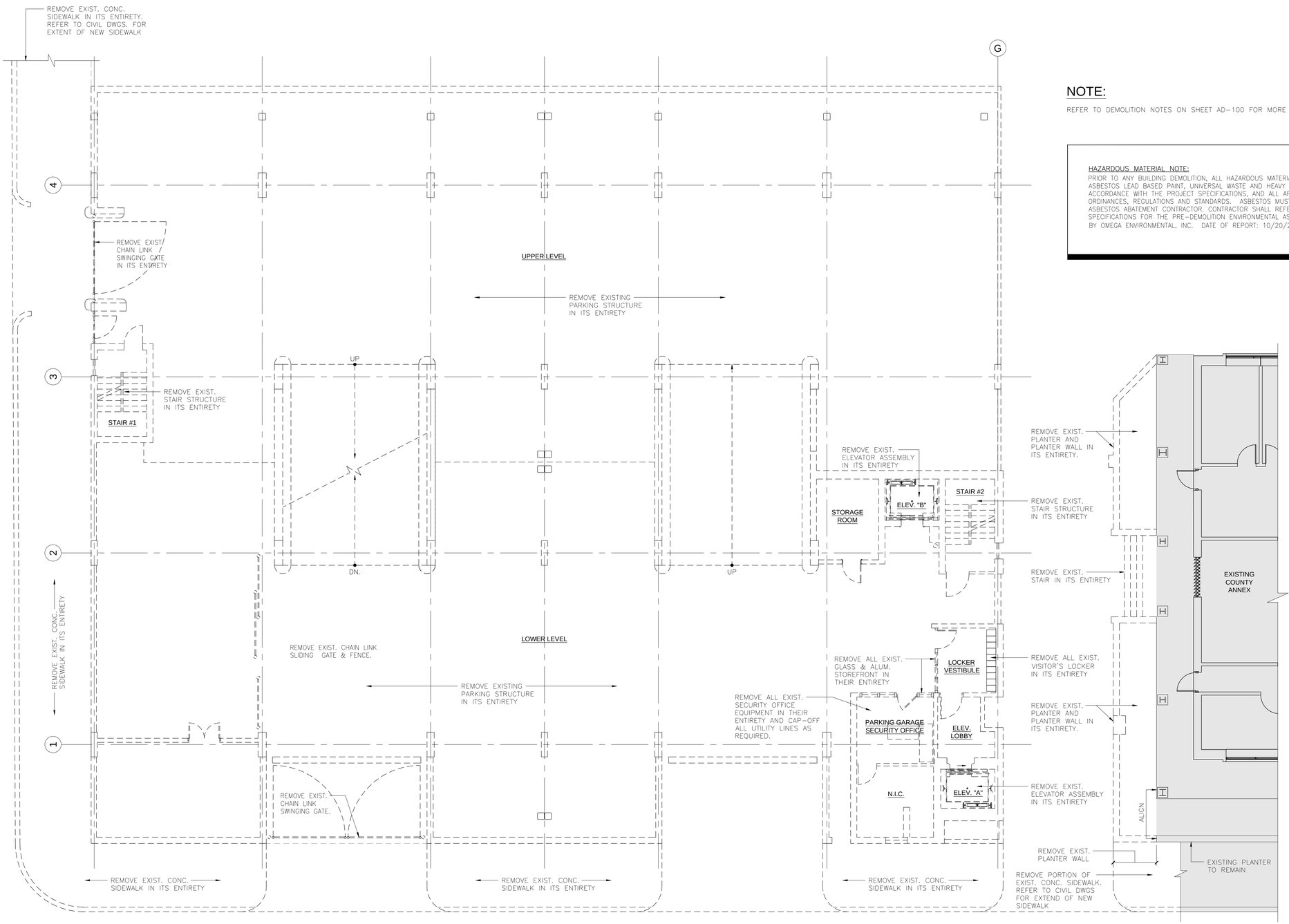
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

AD-100



NOTE:

REFER TO DEMOLITION NOTES ON SHEET AD-100 FOR MORE INFORMATION.

HAZARDOUS MATERIAL NOTE:

PRIOR TO ANY BUILDING DEMOLITION, ALL HAZARDOUS MATERIALS INCLUDING ASSOCIATED ASBESTOS LEAD BASED PAINT, UNIVERSAL WASTE AND HEAVY METALS SHALL BE REMOVED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND ALL APPLICABLE LAWS, RULES, ORDINANCES, REGULATIONS AND STANDARDS. ASBESTOS MUST BE REMOVED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR. CONTRACTOR SHALL REFER TO THE PROJECT SPECIFICATIONS FOR THE PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT, PREPARED BY OMEGA ENVIRONMENTAL, INC. DATE OF REPORT: 10/20/2020.

FIRST FLOOR DEMOLITION PLAN

AD-101 SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIRST FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

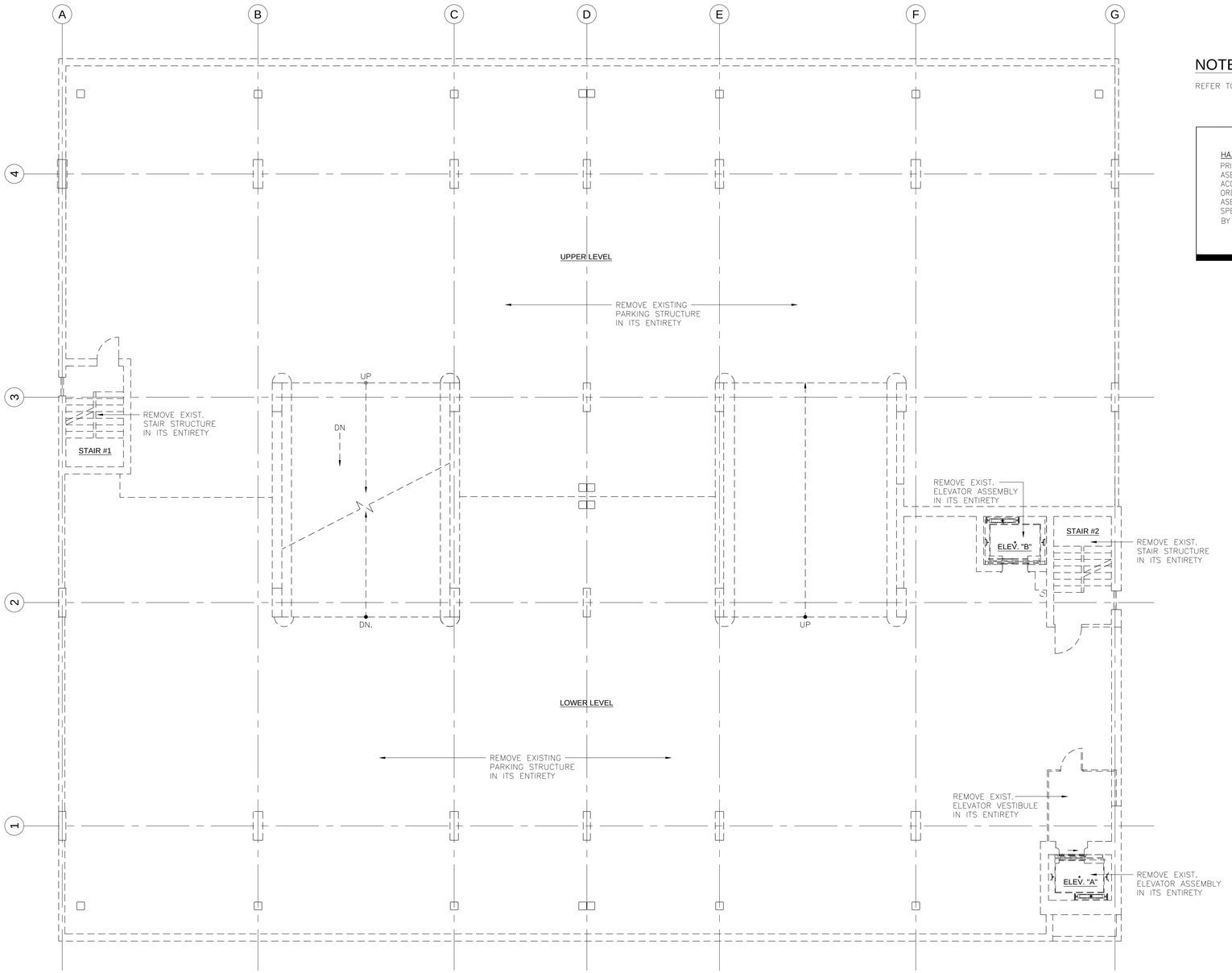
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

AD-101



SECOND - SIXTH FLOOR DEMOLITION PLAN

AD-102 SCALE: 1/8"=1'-0"

NOTE:

REFER TO DEMOLITION NOTES ON SHEET AD-100 FOR MORE INFORMATION.

HAZARDOUS MATERIAL NOTE:

PRIOR TO ANY BUILDING DEMOLITION, ALL HAZARDOUS MATERIALS INCLUDING ASSOCIATED ASBESTOS LEAD BASED PAINT, UNIVERSAL WASTE AND HEAVY METALS SHALL BE REMOVED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND ALL APPLICABLE LAWS, RULES, ORDINANCES, REGULATIONS AND STANDARDS. ASBESTOS MUST BE REMOVED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR. CONTRACTOR SHALL REFER TO THE PROJECT SPECIFICATIONS FOR THE PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT, PREPARED BY OMEGA ENVIRONMENTAL, INC. DATE OF REPORT: 10/20/2020.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECOND - SIXTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

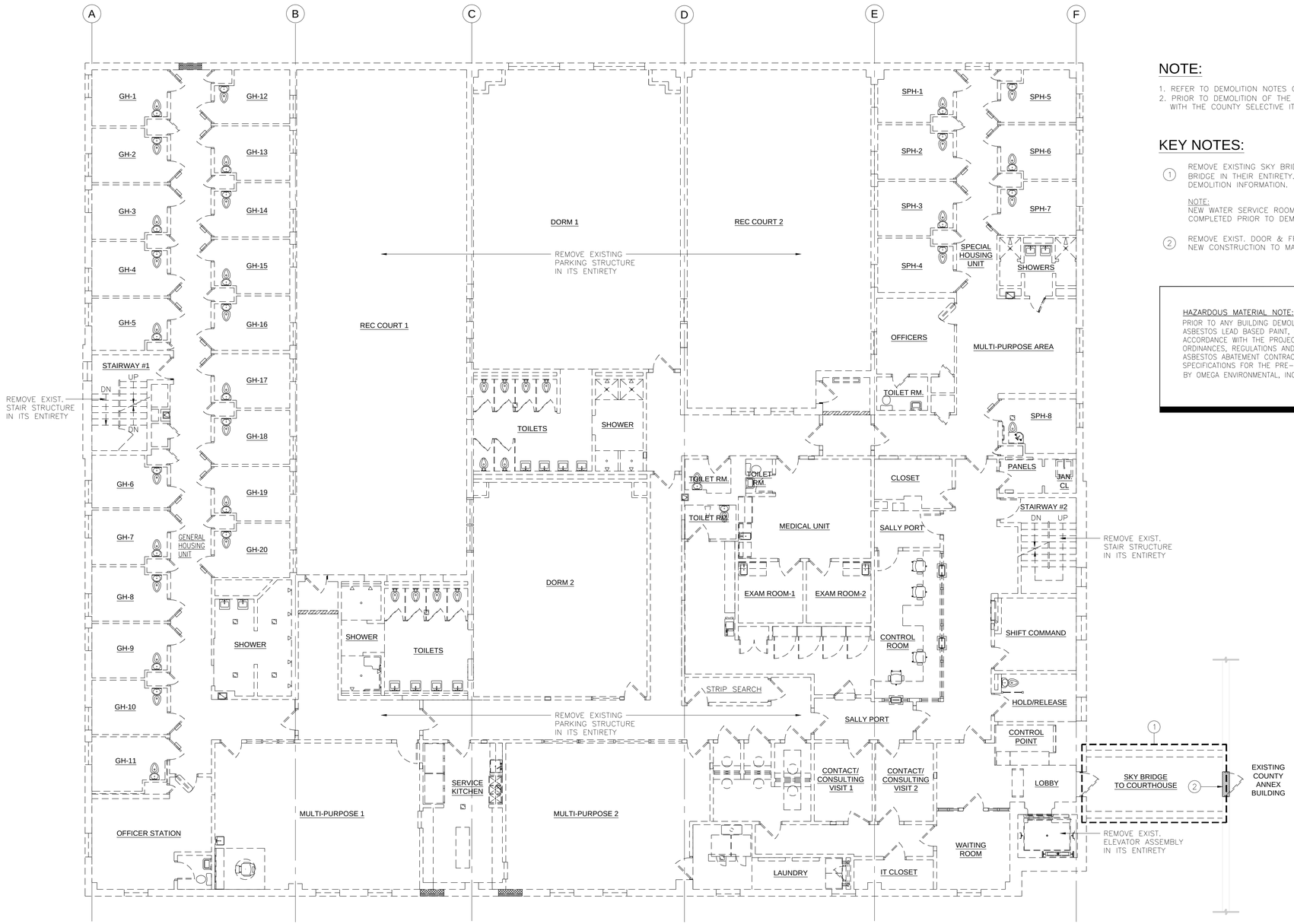
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

AD-102



SEVENTH FLOOR DEMOLITION PLAN
AD-103 SCALE: 1/8"=1'-0"

NOTE:

1. REFER TO DEMOLITION NOTES ON SHEET AD-100 FOR MORE INFORMATION.
2. PRIOR TO DEMOLITION OF THE 7TH FLOOR, THE CONTRACTOR SHALL COORDINATE/CONFIRM WITH THE COUNTY SELECTIVE ITEMS TO BE SALVAGED.

KEY NOTES:

(1) REMOVE EXISTING SKY BRIDGE AND ALL ASSOCIATED UTILITY LINES RUNNING ALONG BRIDGE IN THEIR ENTIRETY. REFER TO ENGINEER'S DRAWINGS FOR M.E.P RELATED DEMOLITION INFORMATION.

NOTE:
NEW WATER SERVICE ROOM IN ANNEX BUILDING AND ALL ASSOCIATED WORK SHALL BE COMPLETED PRIOR TO DEMOLITION OF THE SKY BRIDGE AND PARKING GARAGE.

(2) REMOVE EXIST. DOOR & FRAME ASSEMBLY AT SKY BRIDGE AND INFILL WALL OPENING WITH NEW CONSTRUCTION TO MATCH EXISTING ADJACENT EXTERIOR AND INTERIOR WALLS.

HAZARDOUS MATERIAL NOTE:
PRIOR TO ANY BUILDING DEMOLITION, ALL HAZARDOUS MATERIALS INCLUDING ASSOCIATED ASBESTOS LEAD BASED PAINT, UNIVERSAL WASTE AND HEAVY METALS SHALL BE REMOVED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND ALL APPLICABLE LAWS, RULES, ORDINANCES, REGULATIONS AND STANDARDS. ASBESTOS MUST BE REMOVED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR. CONTRACTOR SHALL REFER TO THE PROJECT SPECIFICATIONS FOR THE PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT, PREPARED BY OMEGA ENVIRONMENTAL, INC. DATE OF REPORT: 10/20/2020.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SEVENTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

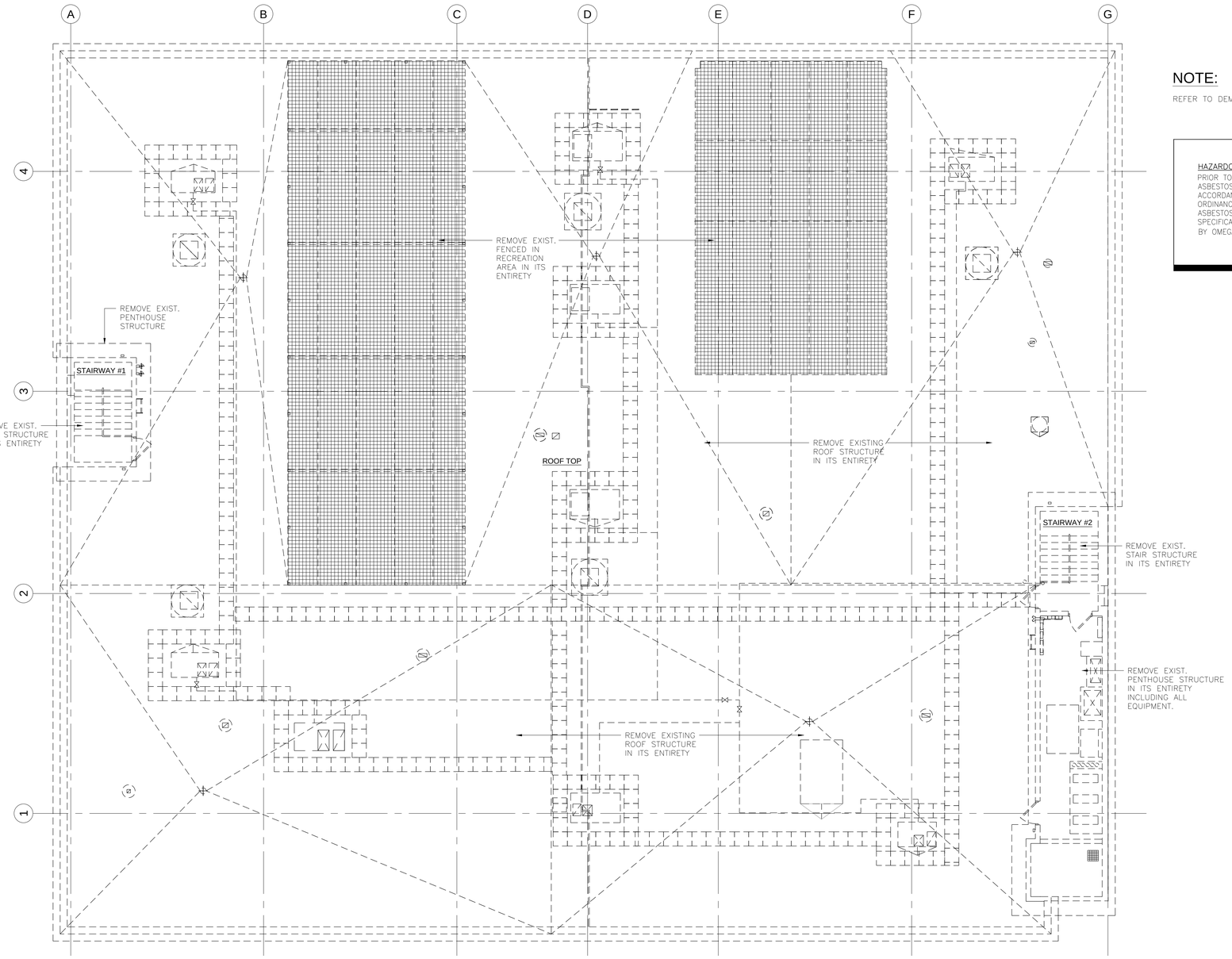
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.
AD-103



NOTE:

REFER TO DEMOLITION NOTES ON SHEET AD-100 FOR MORE INFORMATION.

HAZARDOUS MATERIAL NOTE:

PRIOR TO ANY BUILDING DEMOLITION, ALL HAZARDOUS MATERIALS INCLUDING ASSOCIATED ASBESTOS LEAD BASED PAINT, UNIVERSAL WASTE AND HEAVY METALS SHALL BE REMOVED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, AND ALL APPLICABLE LAWS, RULES, ORDINANCES, REGULATIONS AND STANDARDS. ASBESTOS MUST BE REMOVED BY A LICENSED ASBESTOS ABATEMENT CONTRACTOR. CONTRACTOR SHALL REFER TO THE PROJECT SPECIFICATIONS FOR THE PRE-DEMOLITION ENVIRONMENTAL ASSESSMENT REPORT, PREPARED BY OMEGA ENVIRONMENTAL, INC. DATE OF REPORT: 10/20/2020.

ROOF DEMOLITION PLAN
AD-104 SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

FRANCISCO J. MELENDEZ, SR., AIA
NJ License No. AI 12118

MARK E. BESS, AIA, NCARB
NJ License No. AI 16160

LAURENCE K. UHER, AIA, LEED, AP
NJ License No. AI 14394

SHEET CONTENTS:

ROOF DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	06.04.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

AD-104

PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A-240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A-240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A-240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A-240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

FIRST TIER PLAN
SCALE: 1/8"=1'-0"

ELIZABETHTOWN PLAZA

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIRST TIER PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

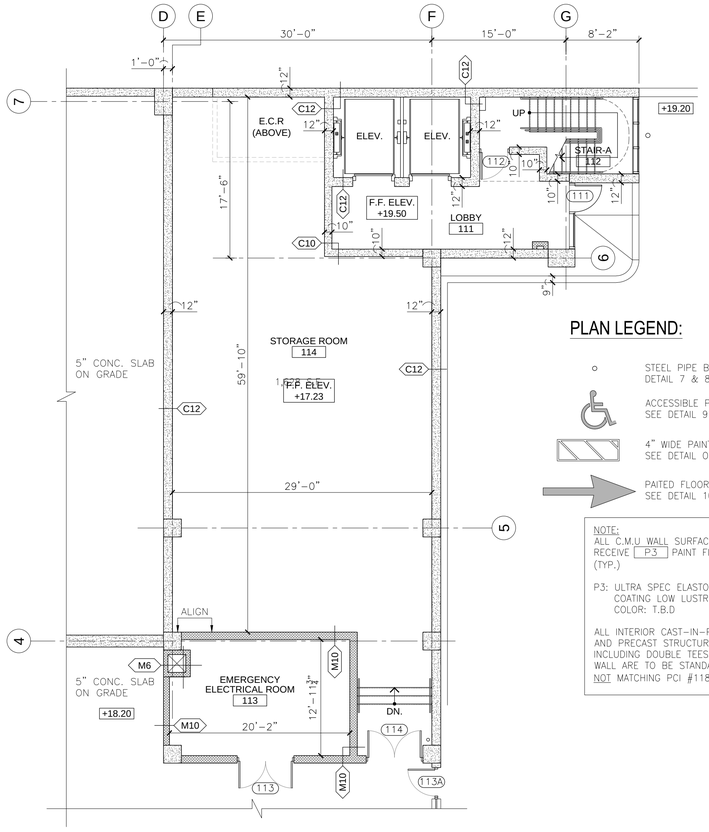
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-100



PLAN LEGEND:

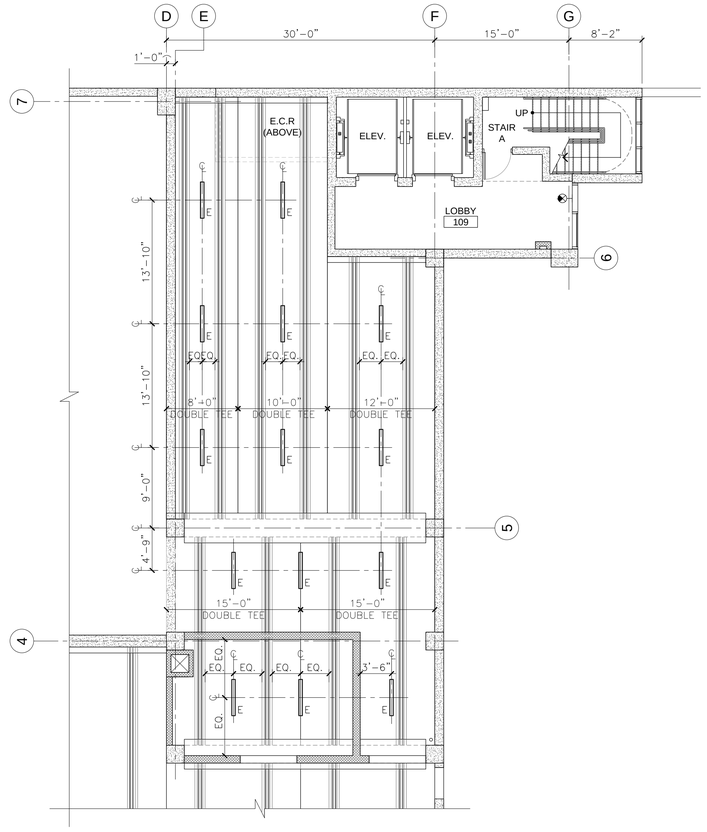
- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A-240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A-240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A-240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A-240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P.3 PAINT FINISH U.O.N (TYP.)

P.3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0.360
COLOR: T.B.D

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

A-100 FIRST TIER PARTIAL PLAN (PLAN UNDER INTERMEDIATE RAMP LANDING)
SCALE: 1/8"=1'-0"



A-100 FIRST TIER PARTIAL REFLECTED CEILING PLAN (CEILING PLAN UNDER INTERMEDIATE RAMP LANDING AND AT EMERGENCY ELEC. & FACILITIES MANAGEMENT STORAGE ROOMS)
SCALE: 1/8"=1'-0"

REFLECTED CEILING PLAN LEGEND:

- SUSPENDED CLEAN ROOM MYLAR CEILING TILE
  TILE: ARMSTRONG CLEAN ROOM "MYLAR"
  COLOR: WHITE, EDGE PROFILE: SQUARE LAY-IN EDGE
  SIZE: 2' X 2' WITH CLEAN ROOM 15/16" TEE GRID
  NOTE:
  CEILING SYSTEM TO HAVE HOLD DOWN CLIPS
- $ NEW LIGHT SWITCH BY LEVITON. DECORA SERIES COMMERCIAL GRADE ROCKER SWITCH, COLOR WHITE, U.O.N. MOUNTED AT 3'-2" A.F.F., U.O.N.
- 10'-0" CEILING HEIGHT TAG
- DETAIL NUMBER / REFERENCE DRAWING NUMBER

LIGHT FIXTURE LEGEND:

- A: 19" DIA. SURFACE MOUNTED LED PARKING GARAGE LIGHT FIXTURE. MFR: LITHONIA LIGHTING CATALOG: VCPG ULTIMATE LED VCPG LED V_ P_ 40K 80CRI LANE MVOLT PM
- A1: 19" DIA. SURFACE MOUNTED LED PARKING GARAGE LIGHT FIXTURE. MFR: LITHONIA LIGHTING CATALOG: VCPG ULTIMATE LED VCPG LED V_ P_ 40K 80CRI T5E MVOLT PM
- B: 2X2 RECESSED LED LIGHT FIXTURE MFR: LITHONIA LIGHTING – 2VTS2 CATALOG: 2VTS2 60L ADPT EZ1 LP840 NLTAIR2 RES7PDT
- C: PENDANT MOUNTED LED LIGHT FIXTURE MFR: KENALL MFG. CATALOG: EPLB-12-E-PPA-CC-42-40K8-DCC-DV-J9
- D: WALL/CEILING MOUNTED LED LIGHT FIXTURE MFR: LUMINAIRE-LED – TSL9 CATALOG: TSL9 46IN 50W 40K MVOLT OP BLK SENSOR: FAM7 HARDWARE: PHSC
- E: PENDANT MOUNTED LED LIGHT FIXTURE MFR: LITHONIA LIGHTING – BLWP CATALOG: BLWP4 48L ADPT EZ1 LP840 NLTAIR2 RES7PDT
- F: WALL MOUNTED LIGHT FIXTURE MFR: KENALL – MODEL: FN15 CATALOG: FN15-2-CC-49L-40K8-DV-2C-SA-9500-LP
- G: WALL MOUNTED LIGHT FIXTURE MFR: KENALL – MODEL: FN09 CATALOG: FN09-4-CC-24L-40K8-DV-SA-9500-LP
- CEILING MOUNTED EXIT LIGHT FIXTURE MFR: KENALL – MILLENIUM METREX CATALOG: METSW-MW-R-DT-CEL-9500-LP NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS
- WALL MOUNTED EXIT LIGHT FIXTURE MFR: KENALL – MILLENIUM METREX CATALOG: METS/DU-MW-R-DT-CEL-9500-LP NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS
- WALL MOUNTED EMERGENCY LIGHT FIXTURE WITH BACK-UP BATTERY MFR: KENALL – METEL SERIES CATALOG: METEL-24N-MW-6-5L-DT-CEL-9500-LP

NETTA ARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIRST TIER PARTIAL PLAN & PARTIAL REFLECTED CEILING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

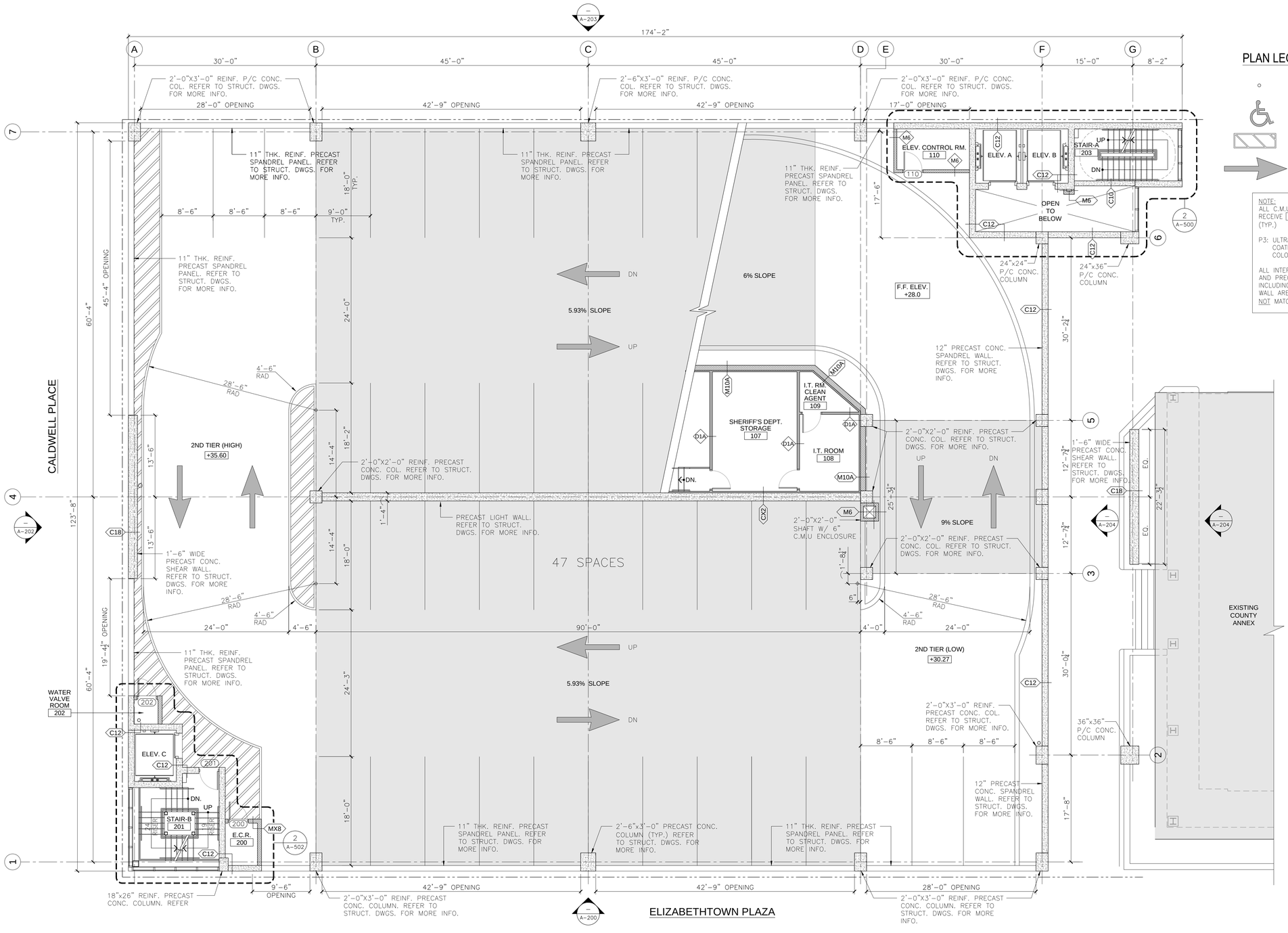
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-101



ELIZABETHTOWN PLAZA

PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A–240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A–240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A–240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A–240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST–IN–PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

A–101 SECOND TIER PLAN
SCALE: 1/8"=1'–0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECOND TIER PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

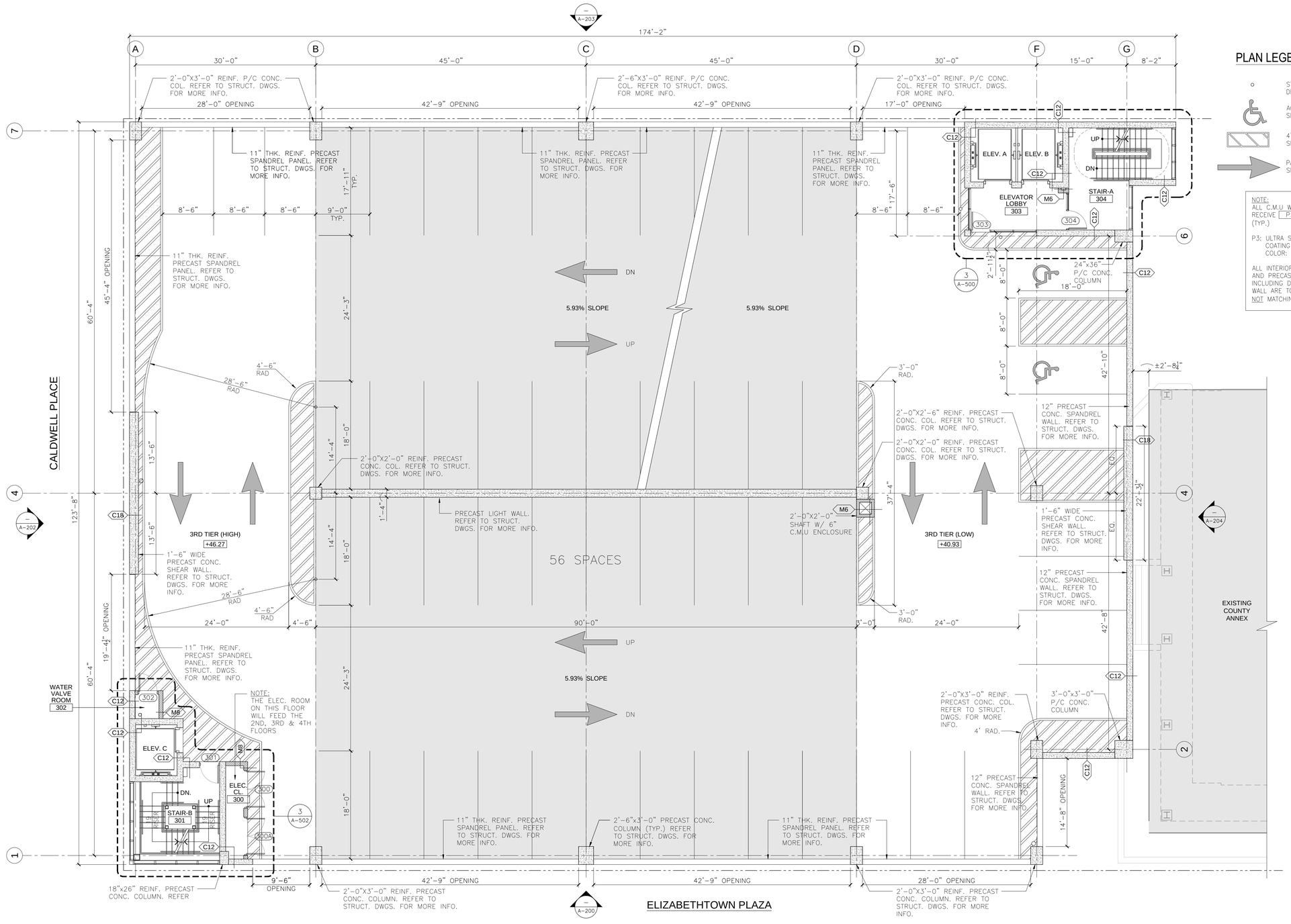
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-102



PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A–240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A–240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A–240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A–240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST–IN–PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

THIRD TIER PLAN
A–102
SCALE: 1/8"=1'–0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.277.2626
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

THIRD TIER PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

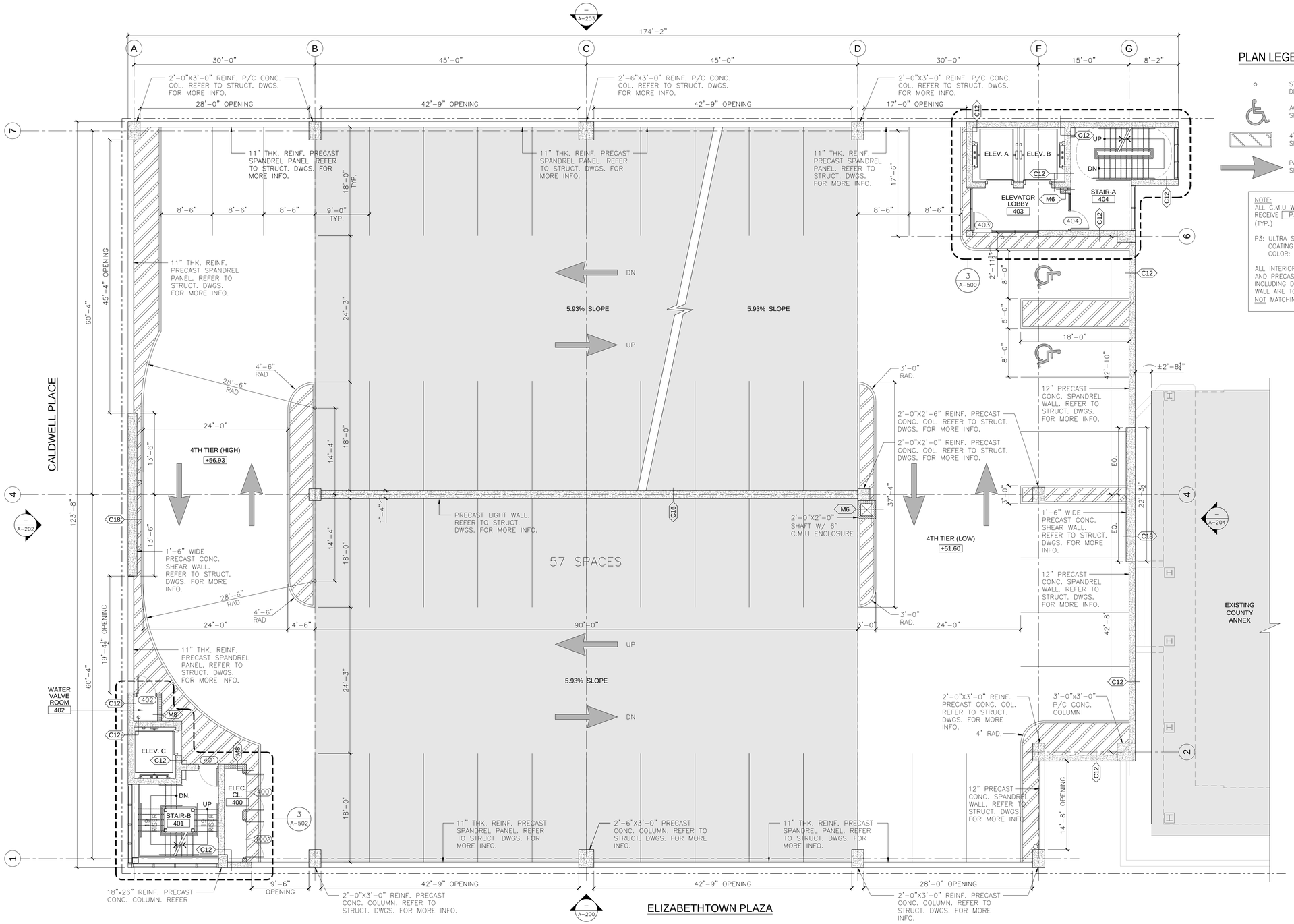
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-103



ELIZABETHTOWN PLAZA

PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A–240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A–240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A–240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A–240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST–IN–PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

FOURTH TIER PLAN
SCALE: 1/8"=1'–0"

A–103

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.277.2080
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FOURTH TIER PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

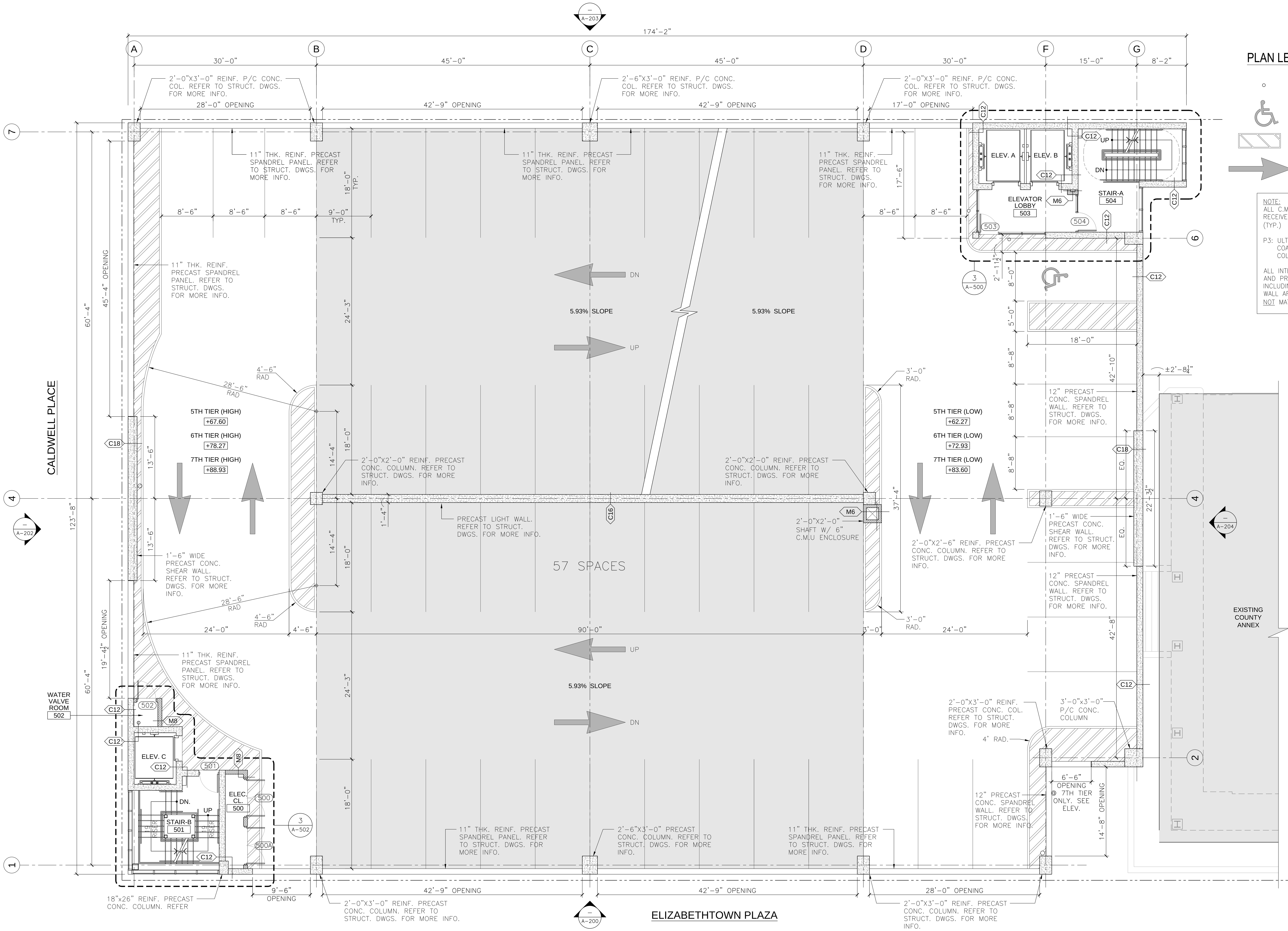
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-104



FIFTH - SEVENTH TIER PLAN (TYPICAL)
SCALE: 1/8"=1'-0"

PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A-240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A-240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A-240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A-240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2090
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:
FIFTH - SEVENTH TIER PLAN

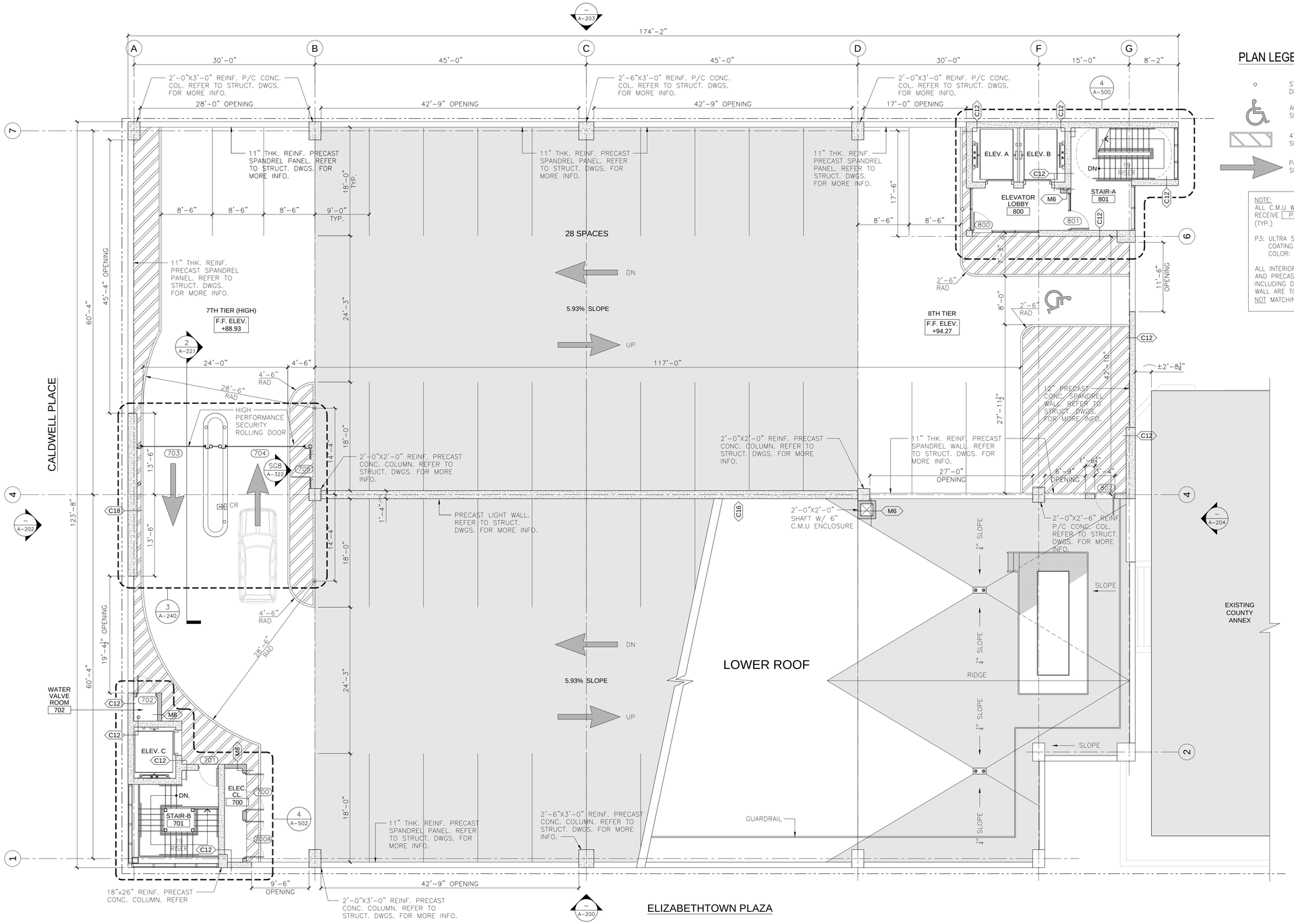
PROJECT TITLE:
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.
A-105



PLAN LEGEND:

- STEEL PIPE BOLLARD. SEE DETAIL 7 & 8 ON A-240
- ACCESSIBLE PARKING SPACE. SEE DETAIL 9 ON A-240
- 4" WIDE PAINTED PARKING STRIPES. SEE DETAIL ON 5 A-240
- PAITED FLOOR ARROW. SEE DETAIL 10 ON A-240

NOTE:
ALL C.M.U WALL SURFACES SHALL RECEIVE P3 PAINT FINISH U.O.N (TYP.)

P3: ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360
COLOR: T.B.D

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

EIGHTH TIER PLAN
A-105
SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.277.2626
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
nettaarch@gmail.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

EIGHTH TIER PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

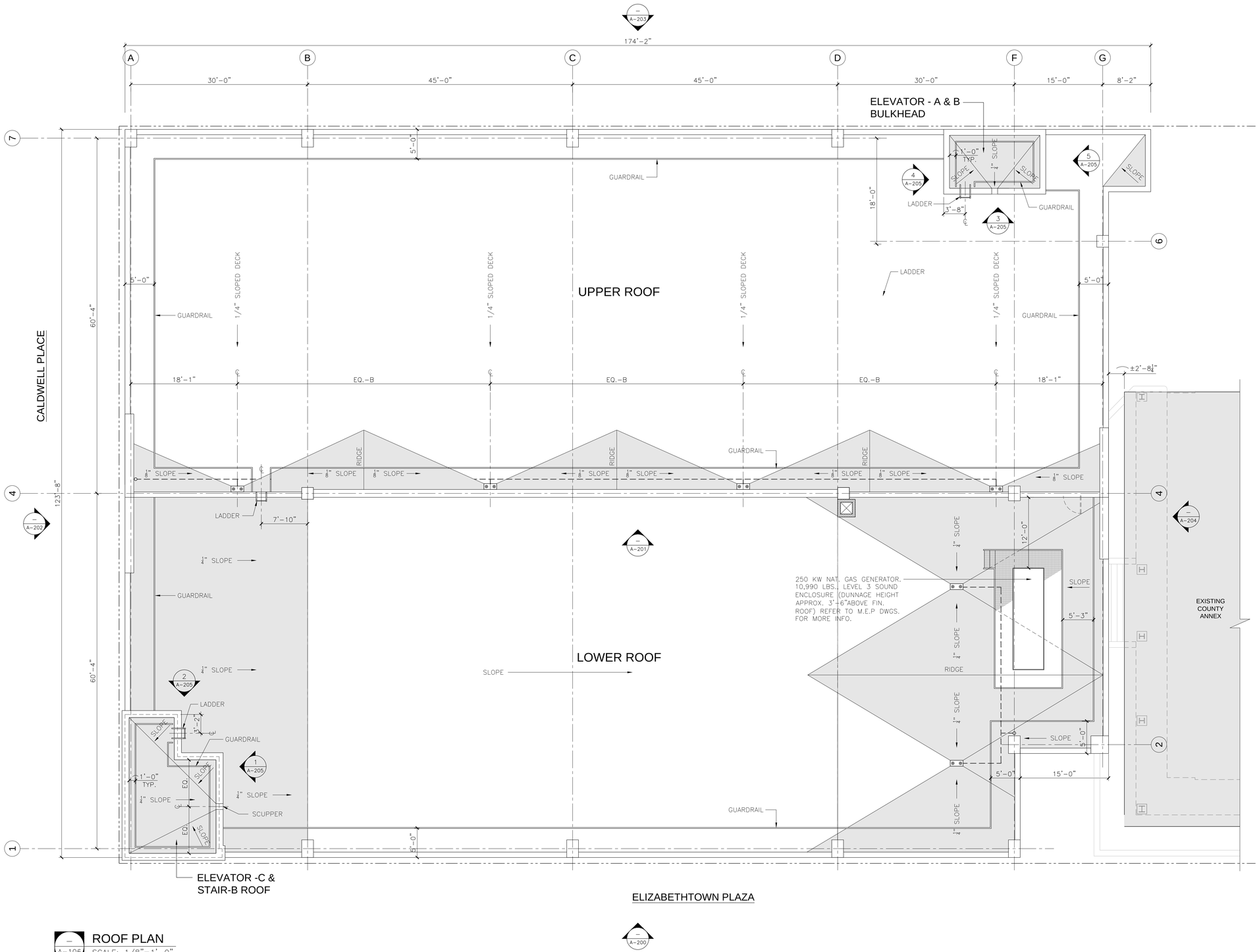
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-106



ROOF PLAN
A-106 SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2080
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ROOF PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

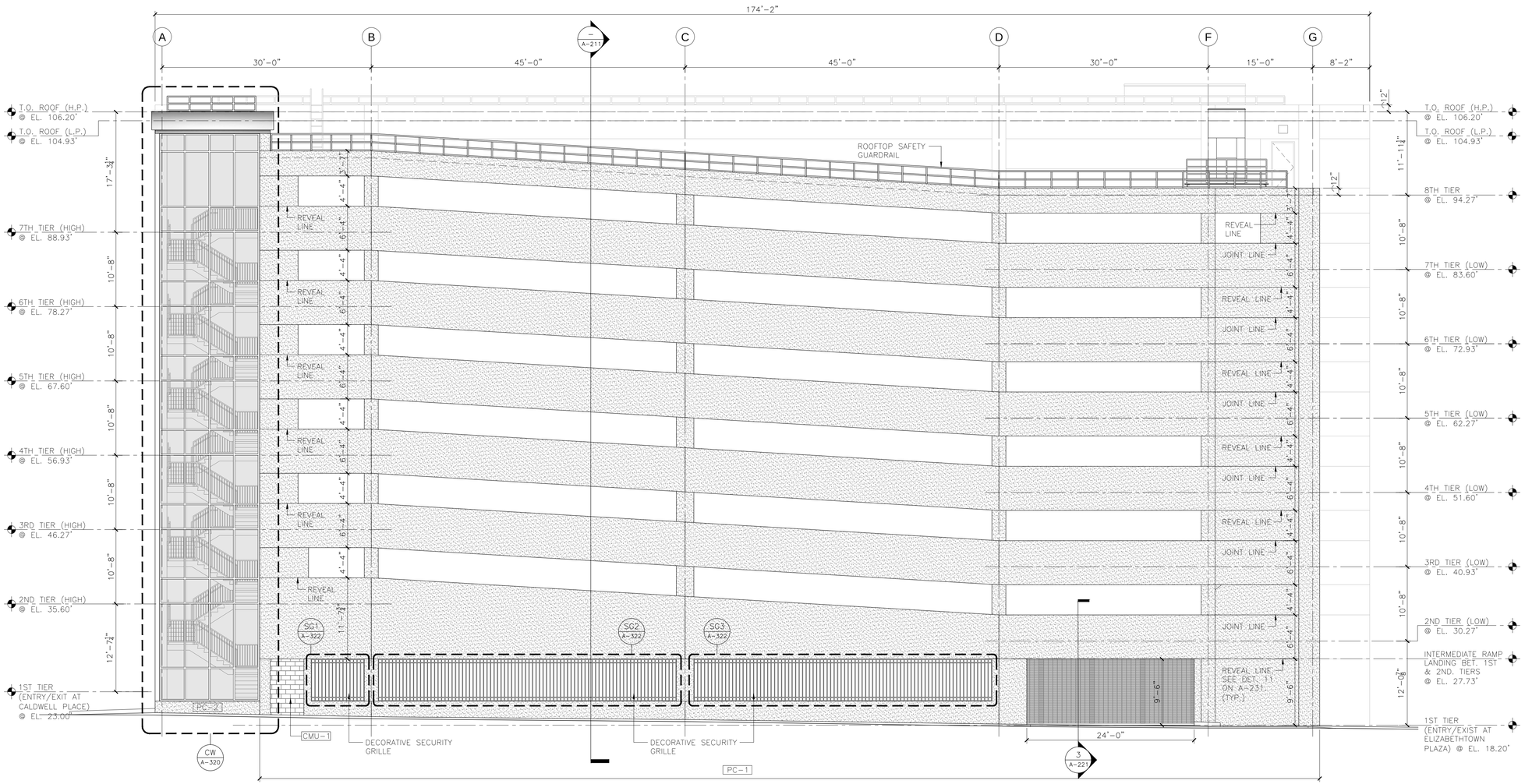
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-107



A / A-200 PRIMARY BUILDING ELEVATION (ELIZABETHTOWN PLAZA)
SCALE: 1/8" = 1'-0"

ELEVATION FINISH SCHEDULE

NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

NOTE:

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTA ARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2666
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

PRIMARY BUILDING ELEVATION ELIZABETHTOWN PLAZA

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

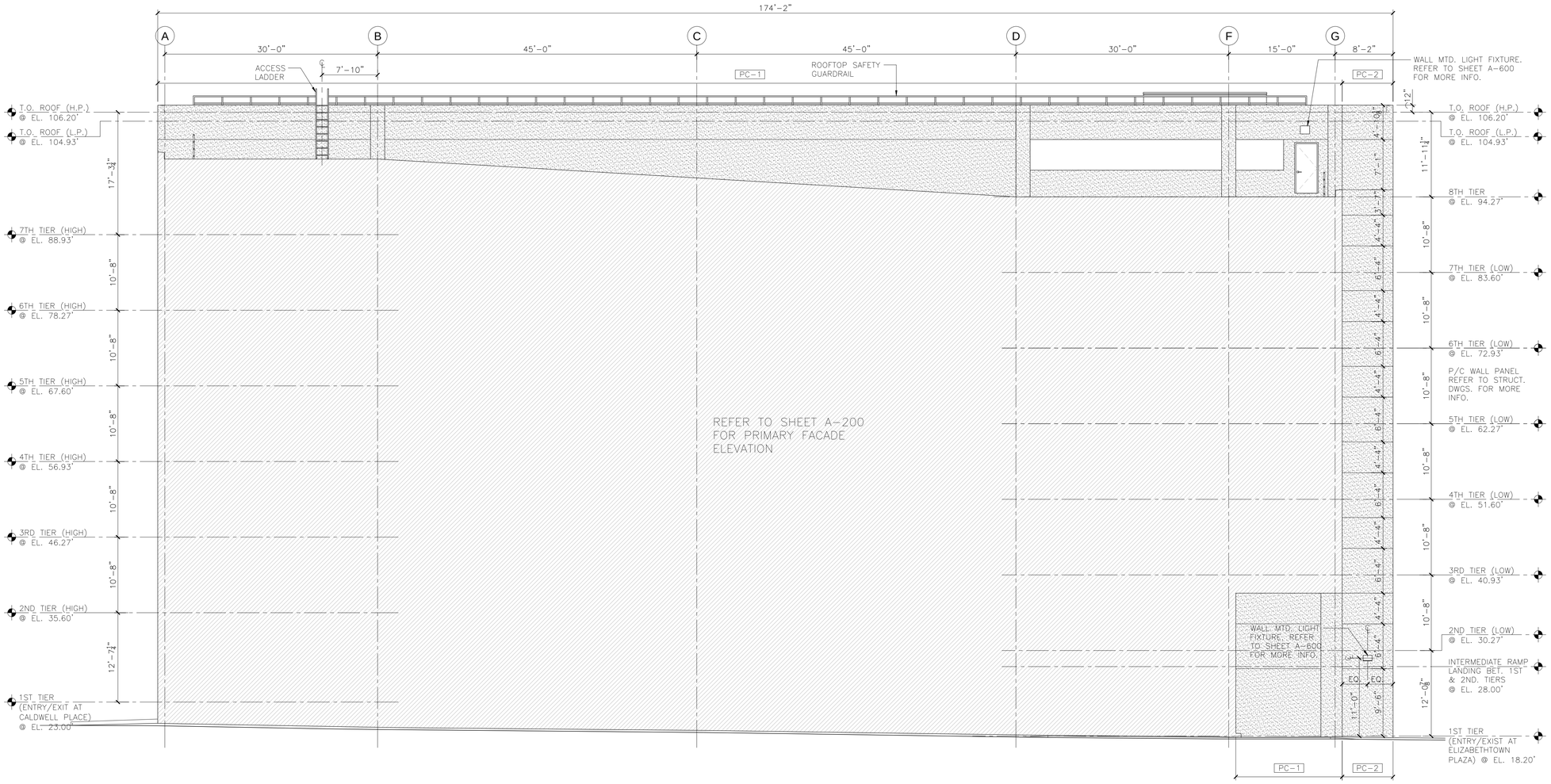
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-200



A / A-201 SECONDARY BUILDING ELEVATION (BEYOND PRIMARY FACADE - ELIZABETHTOWN PLAZA)

SCALE: 1/8" = 1'-0"

DATUM LINE @ 0.0'

ELEVATION FINISH SCHEDULE

NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

NOTE:

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTA ARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECONDARY BUILDING ELEVATION ELIZABETHTOWN PLAZA

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

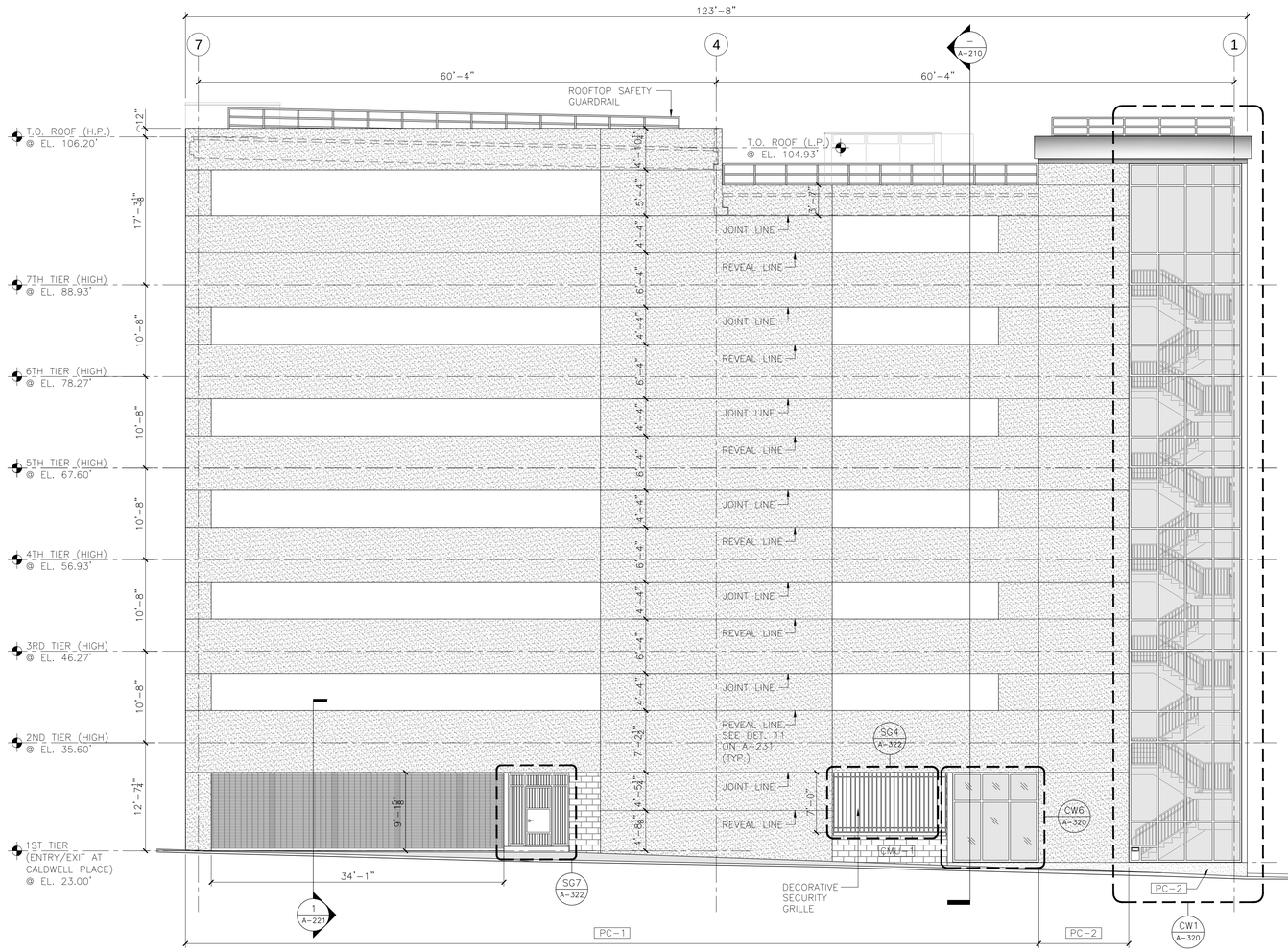
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-201



A A-202 BUILDING ELEVATION (CALDWELL PLACE)
SCALE: 1/8" = 1'-0"

ELEVATION FINISH SCHEDULE

NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

NOTE:

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BUILDING ELEVATION
CALDWELL PLACE

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

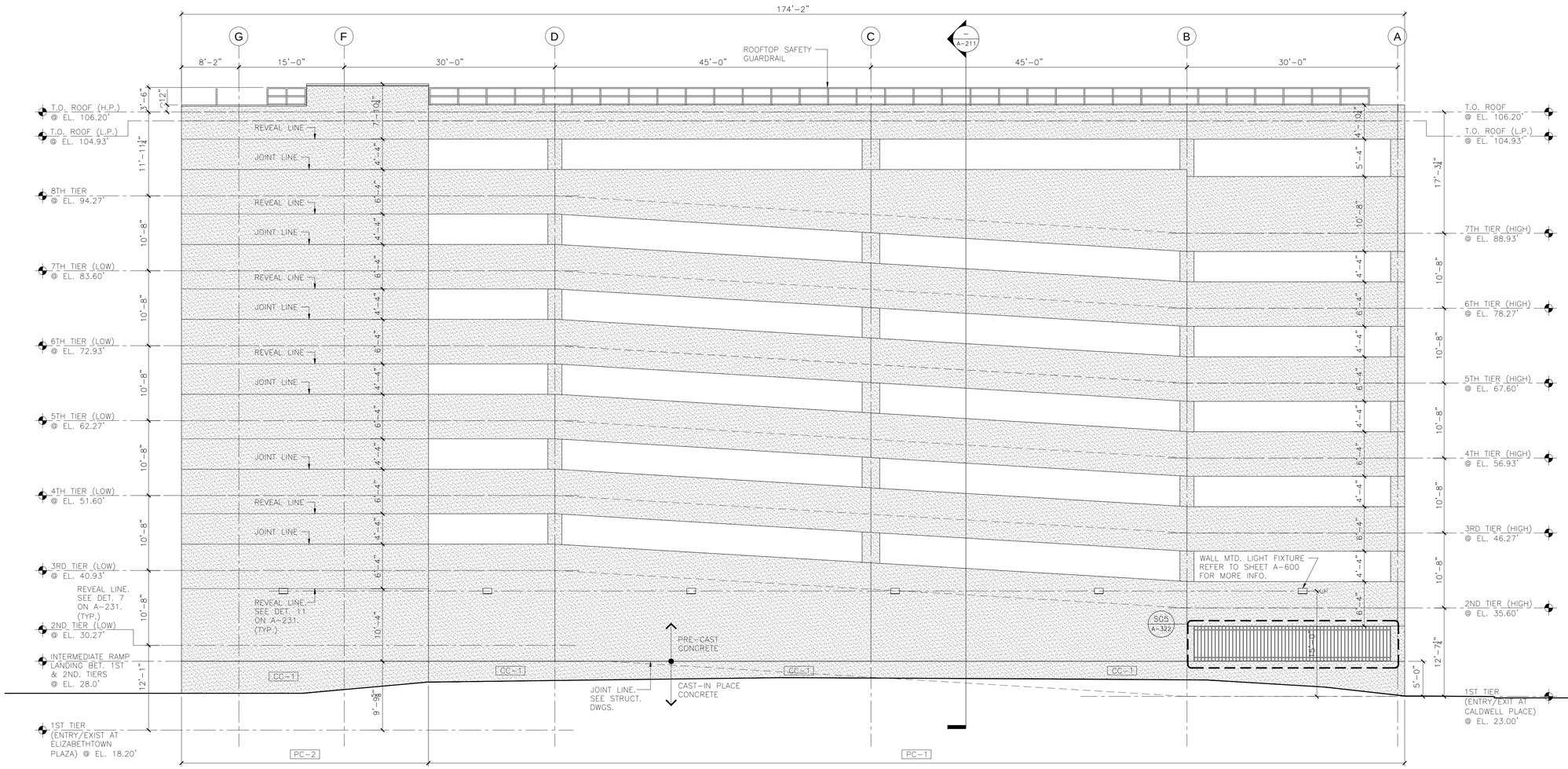
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-202



A / A-203 BUILDING ELEVATION (FACING CEMETERY)
SCALE: 1/8" = 1'-0"

ELEVATION FINISH SCHEDULE

NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

NOTE:

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BUILDING ELEVATION FACING CEMETERY

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

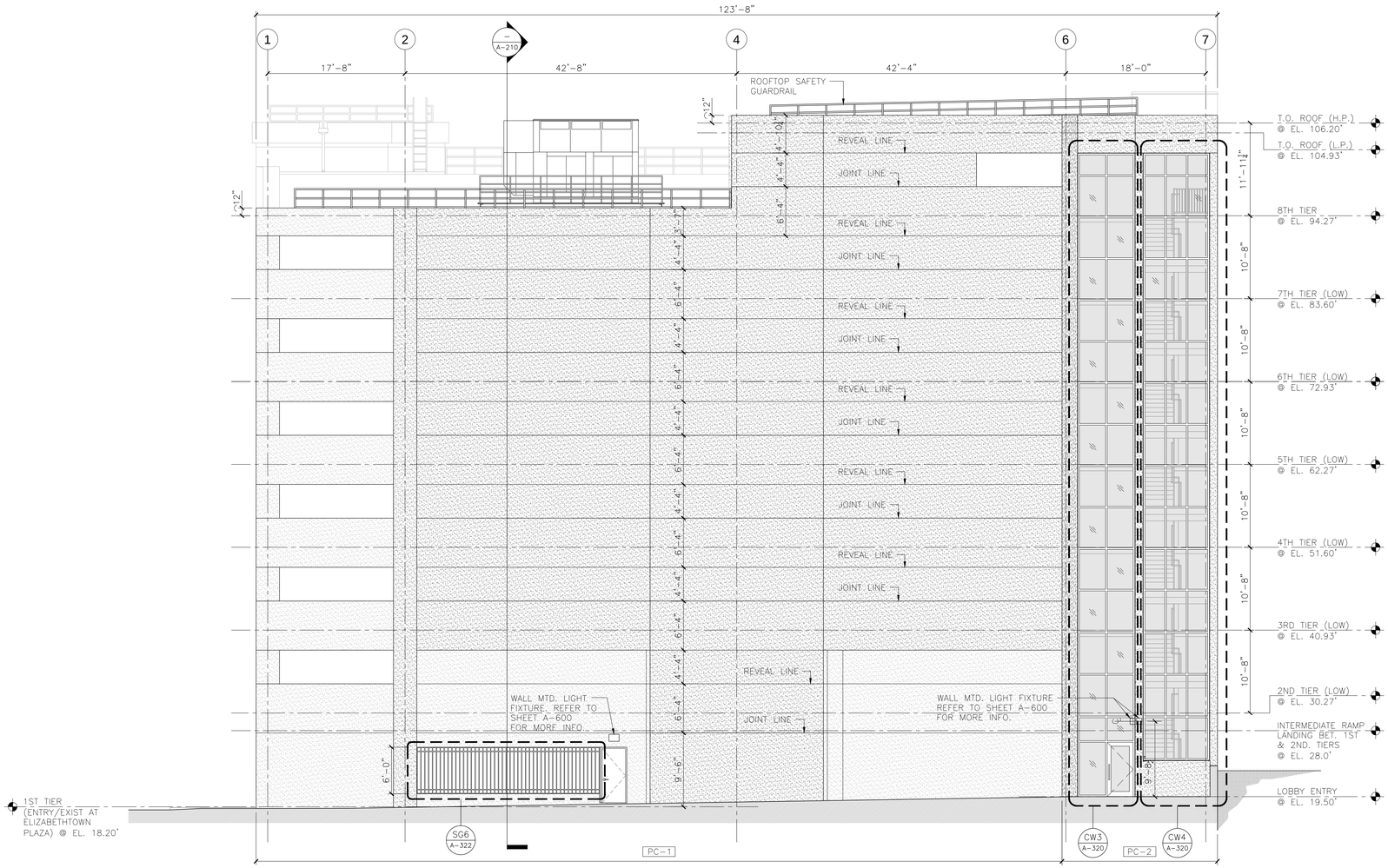
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-203



A
A-204
BUILDING ELEVATION (FACING ANNEX BUILDING)
SCALE: 1/8" = 1'-0"

ELEVATION FINISH SCHEDULE

NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

NOTE:

ALL INTERIOR CAST-IN-PLACE CONCRETE AND PRECAST STRUCTURAL ELEMENTS, INCLUDING DOUBLE TEES, PLANKS, AND LITE WALL ARE TO BE STANDARD GRAY COLOR, NOT MATCHING PCI #118

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BUILDING ELEVATION FACING ANNEX BUILDING

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

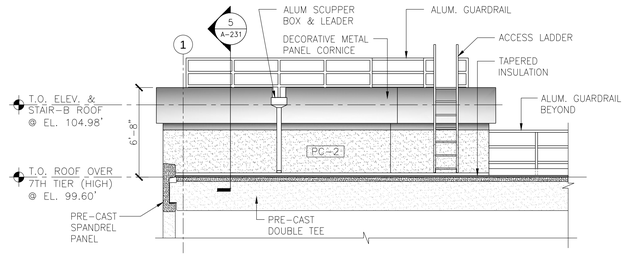
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

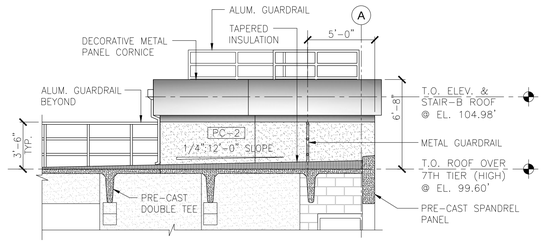
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-204



1 A-205 STAIR & ELEVATOR BULKHEAD TOWER ELEVATION (SOUTH)
SCALE: 3/16" = 1'-0"



2 A-205 STAIR & ELEVATOR BULKHEAD TOWER ELEVATION (EAST)
SCALE: 3/16" = 1'-0"

ELEVATION FINISH SCHEDULE			
NUMBER	DESCRIPTION	COLOR	REMARKS
PC-1	PRECAST CONCRETE, MEDIUM SANDBLAST TEXTURE	PCI 118 BUFF/TAN	
PC-2	PRECAST CONCRETE, LIGHT SANDBLAST TEXTURE	PCI 119 BUFF/TAN	
CMU-1	8X16 SPLIT-FACE CMU W/ INTEGRAL WATER REPELLENT	COLOR T.B.D	
CC-1	C.I.P CONCRETE FOUNDATION	COLOR TO MATCH PCI 118 BUFF/TAN	

3 A-205 ELEVATOR BULKHEAD (WEST)
SCALE: 3/16" = 1'-0"

4 A-205 ELEVATOR BULKHEAD (NORTH)
SCALE: 3/16" = 1'-0"

5 A-205 ELEVATOR BULKHEAD (SOUTH)
SCALE: 3/16" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BULKHEAD ELEVATIONS AT STAIR-B & ELEVATOR-C AND AT ELEVATORS A & B

PROJECT TITLE:

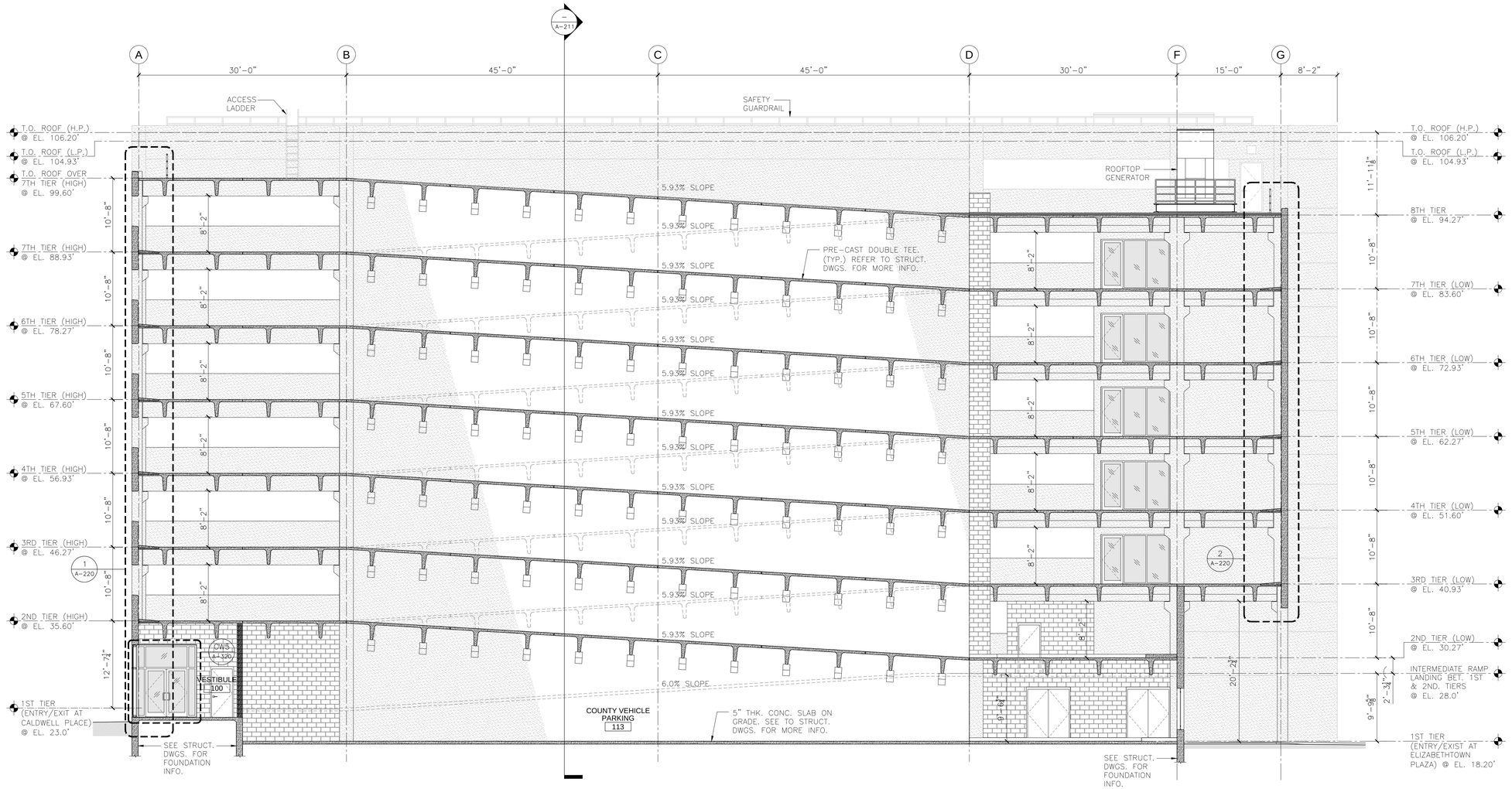
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.
A-205



1 A-210 **BUILDING SECTION** (LONGITUDINAL)
SCALE: 1/8" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2606
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BUILDING SECTION
ELIZABETHTOWN PLAZA

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

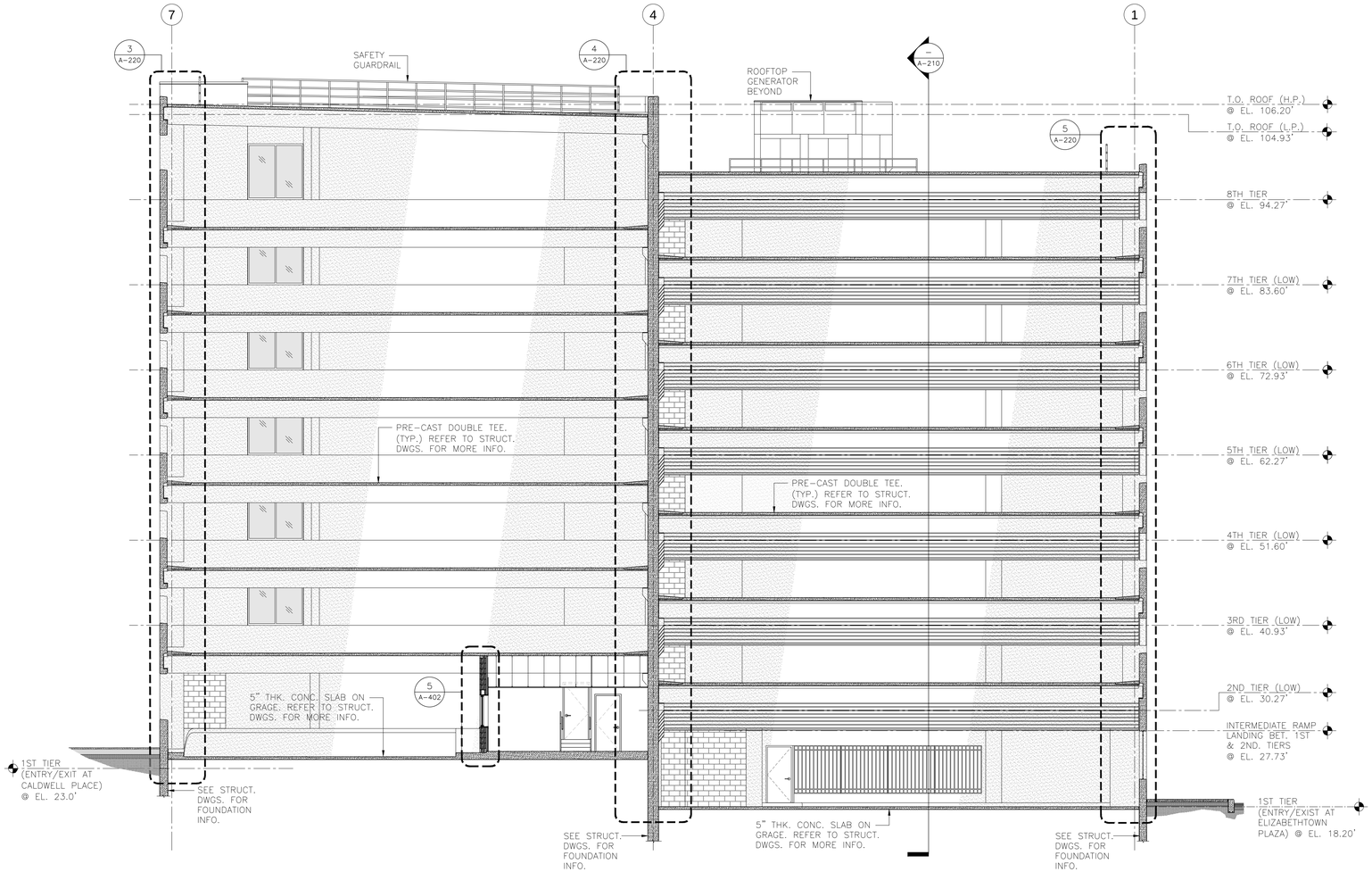
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-210



1 A-211 **BUILDING SECTION** (TRANSVERSE)
SCALE: 1/8" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

BUILDING SECTION
CALDWELL PLACE

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

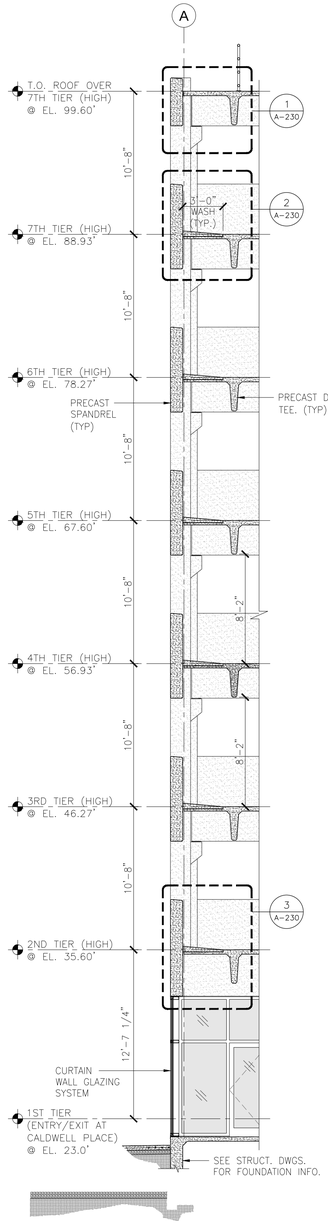
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

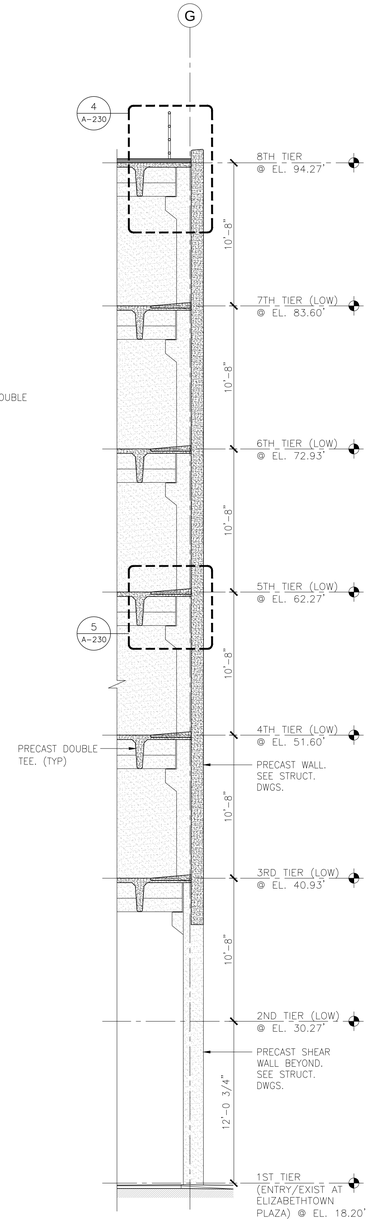
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

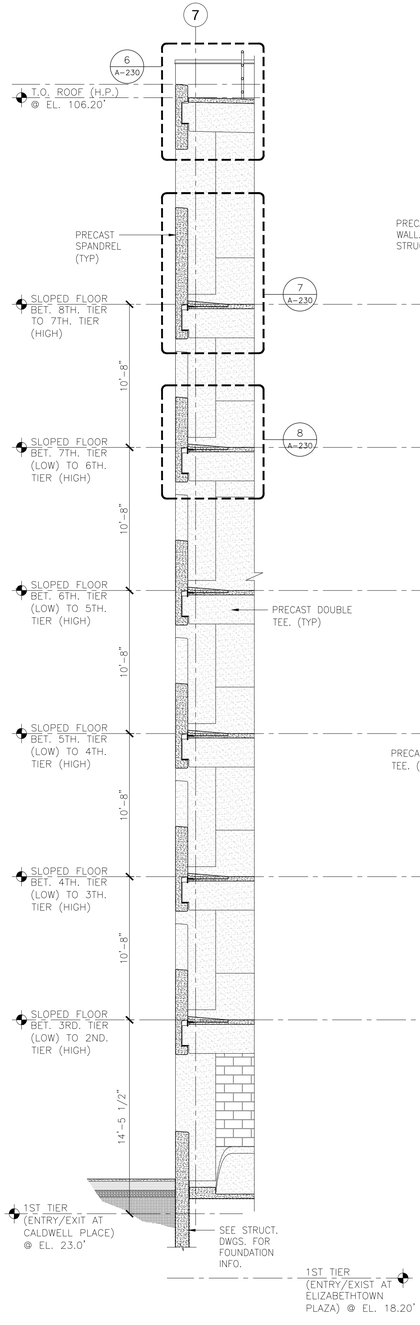
A-211



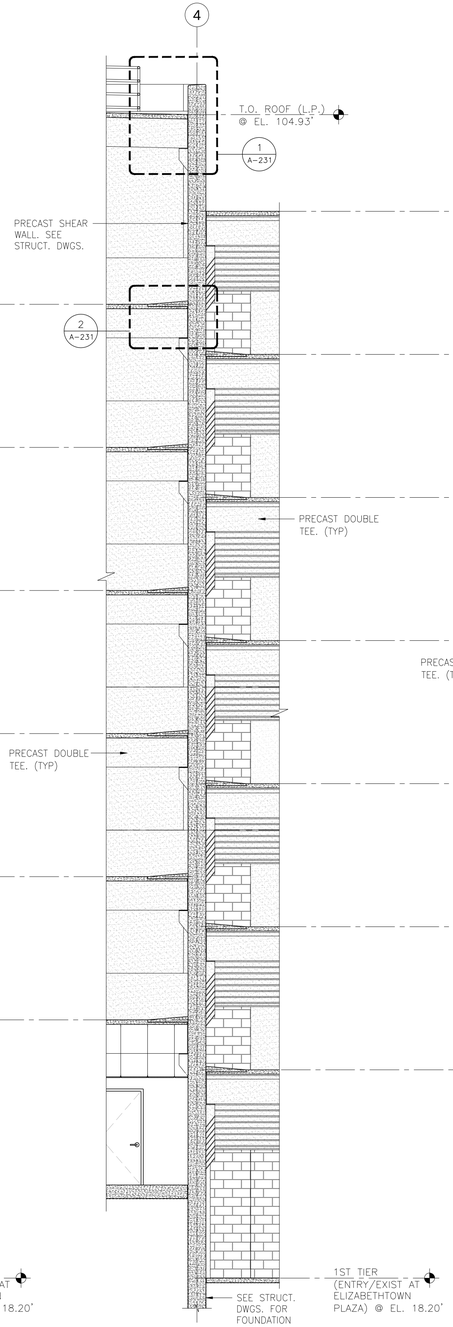
1 A-220 WALL SECTION
SCALE: 3/16" = 1'-0"



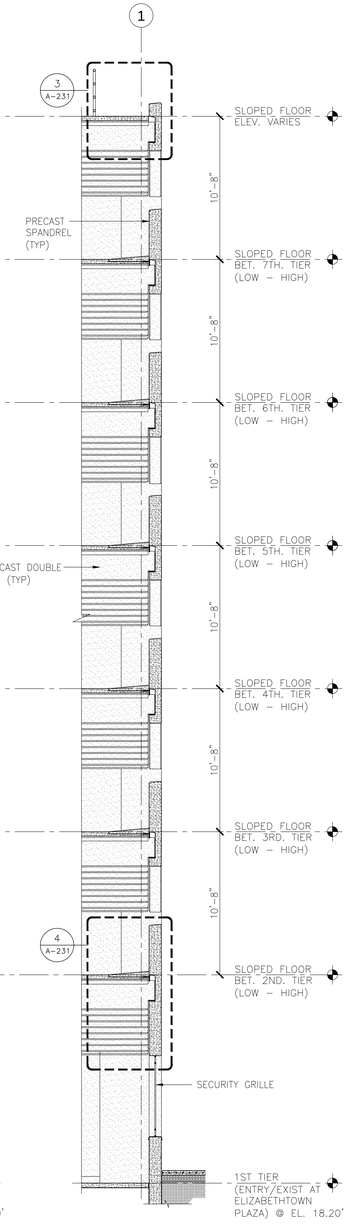
2 A-220 WALL SECTION
SCALE: 3/16" = 1'-0"



3 A-220 WALL SECTION
SCALE: 3/16" = 1'-0"



4 A-220 WALL SECTION
SCALE: 3/16" = 1'-0"



5 A-220 WALL SECTION
SCALE: 3/16" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.0066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
nnetta@nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

WALL SECTIONS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

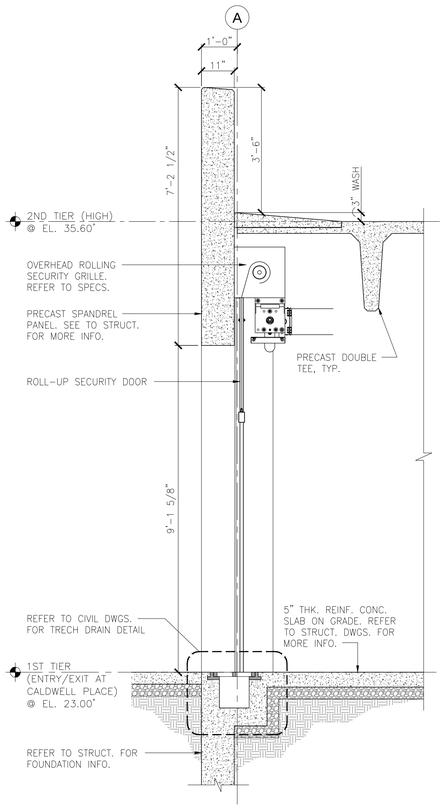
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

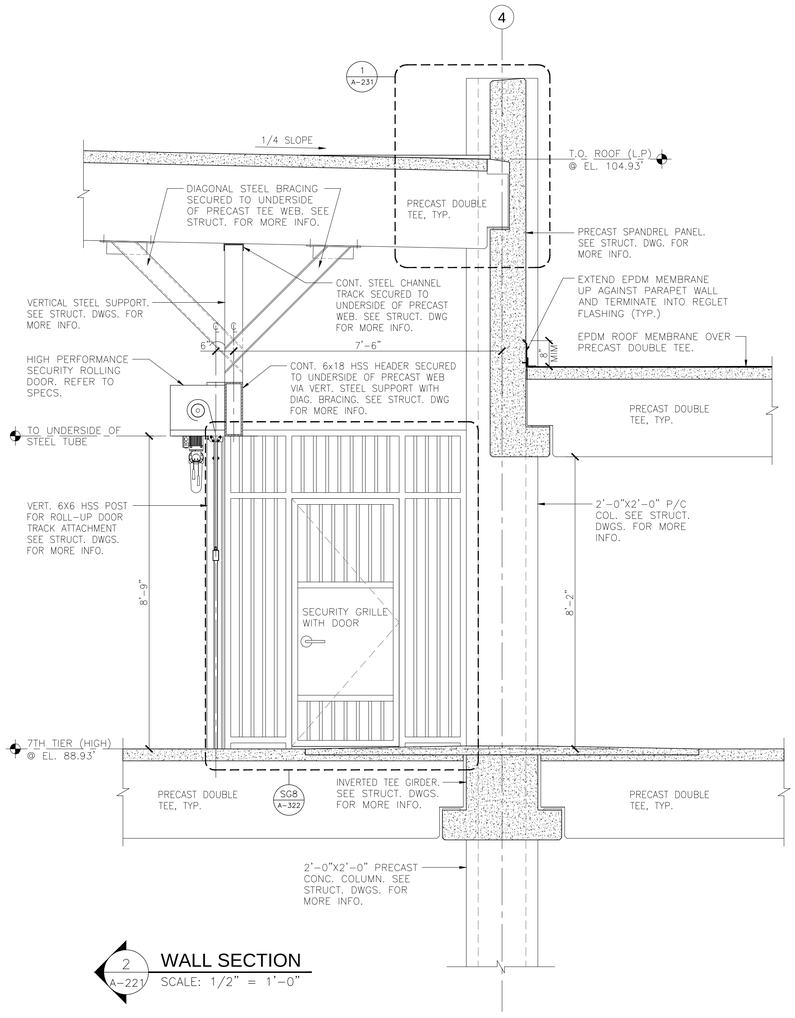
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

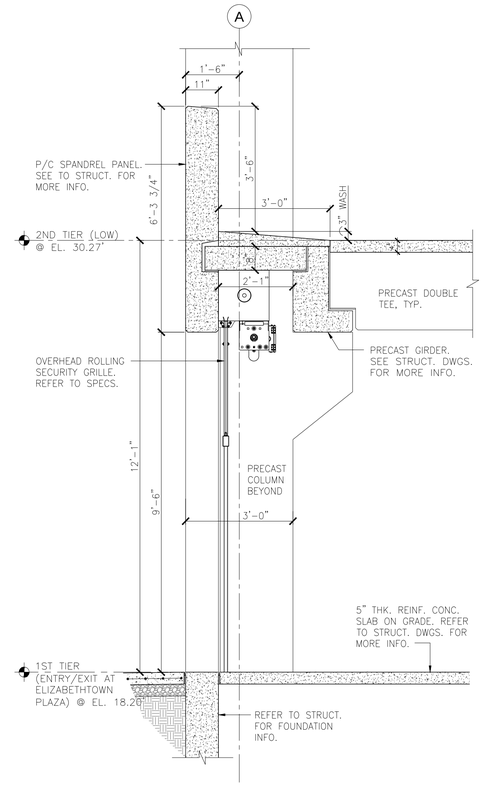
A-220



1 A-221 WALL SECTION
SCALE: 1/2" = 1'-0"



2 A-221 WALL SECTION
SCALE: 1/2" = 1'-0"



3 A-221 WALL SECTION
SCALE: 1/2" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

WALL SECTIONS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

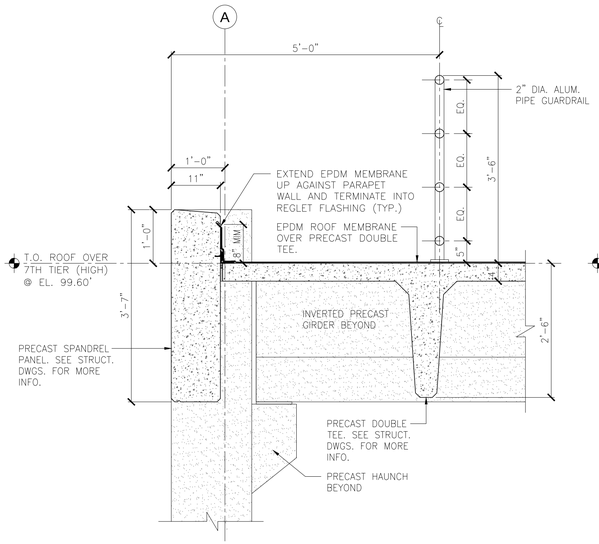
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

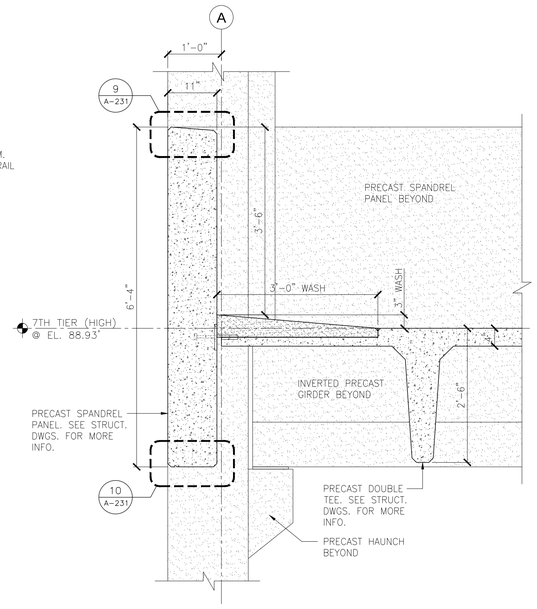
Drawing No.

A-221



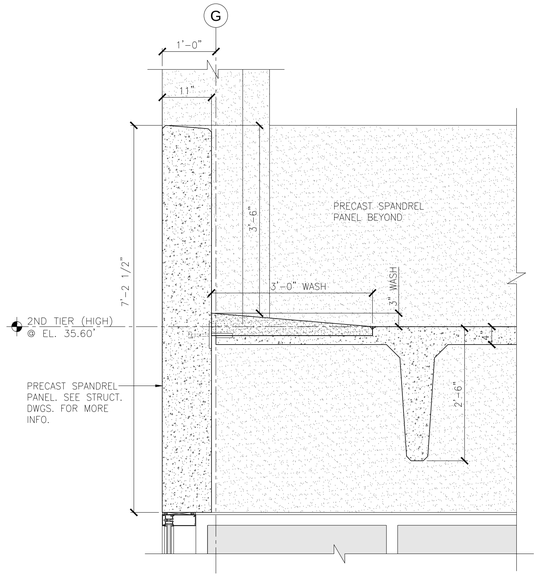
1 A-230 ENLARGED SPANDREL SECTION AT ROOF PARAPET ALONG COL. LINE - A BET. COL. 4 & 1

SCALE: 3/4" = 1'-0"



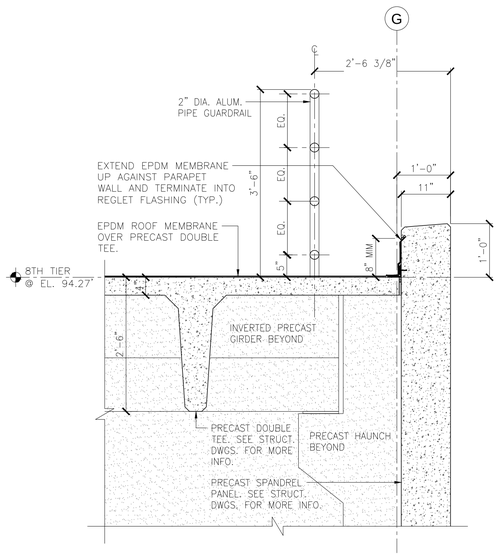
2 A-230 TYP. ENLARGED SPANDREL SECTION FROM 3RD - 7TH TIER ALONG COL. LINE - A

SCALE: 3/4" = 1'-0"



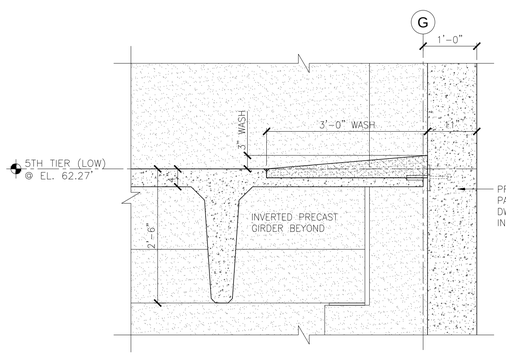
3 A-230 ENLARGED SPANDREL SECTION AT 2ND TIER ALONG COL. LINE - A

SCALE: 3/4" = 1'-0"



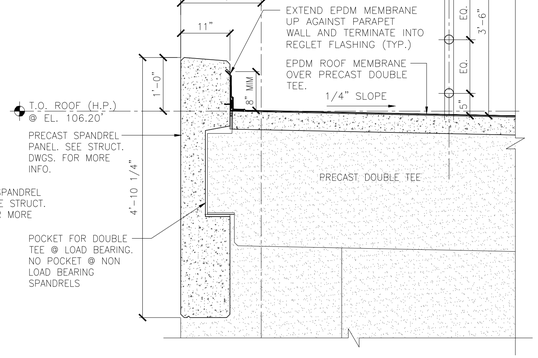
4 A-230 ENLARGED SPANDREL SECTION AT ROOF PARAPET ALONG COL. LINE - G

SCALE: 3/4" = 1'-0"



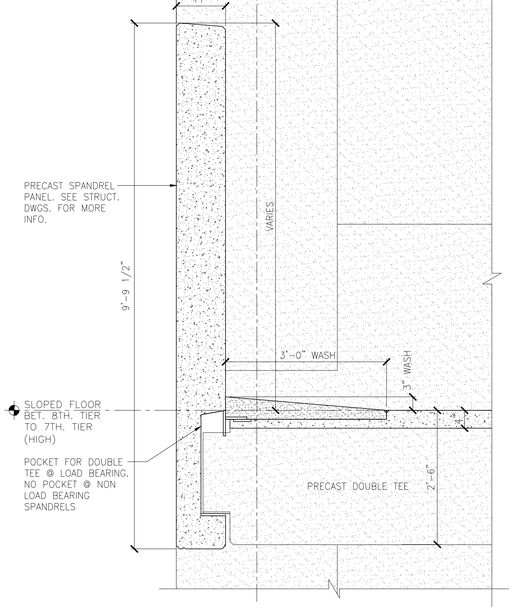
5 A-230 TYP. ENLARGED SPANDREL SECTION AT 3RD - 7TH TIER ALONG COL. LINE - G

SCALE: 3/4" = 1'-0"



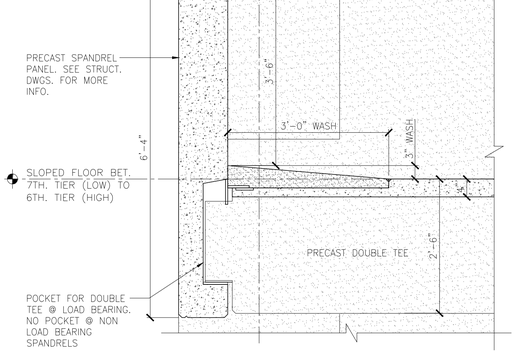
6 A-230 ENLARGED SPANDREL SECTION AT ROOF ALONG COL. LINE - 7

SCALE: 3/4" = 1'-0"



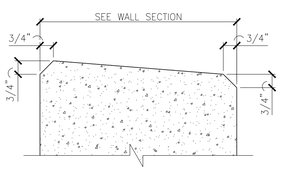
7 A-230 ENLARGE SPANDREL SECTION BETWEEN 7TH TIER (HIGH) AND 8TH TIER ALONG COLUMN LINE - 7 BETWEEN COLUMNS C & B

SCALE: 3/4" = 1'-0"



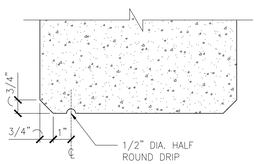
8 A-230 TYP. ENLARGE SPANDREL SECTION FROM 3RD - 7TH TIER ALONG COLUMN LINE 7 BETWEEN COLUMNS C & B

SCALE: 3/4" = 1'-0"



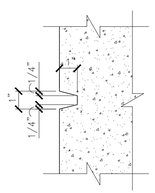
9 A-230 TOP OF SPANDREL DETAIL

SCALE: 3" = 1'-0"



10 A-230 DRIP EDGE DETAIL

SCALE: 3" = 1'-0"



11 A-230 PRECAST REVEAL DETAIL

SCALE: 3" = 1'-0"

NOTE:
DISCONTINUE DRIP EDGE 1" SHORT OF BEARING POCKETS AT SHEAR WALL, WALL PANEL AND COLUMN CONNECTION LOCATIONS. DRIP EDGE SHALL NOT BE VISIBLE AT SPANDREL EDGE SURFACE.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLAGED SECTION DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

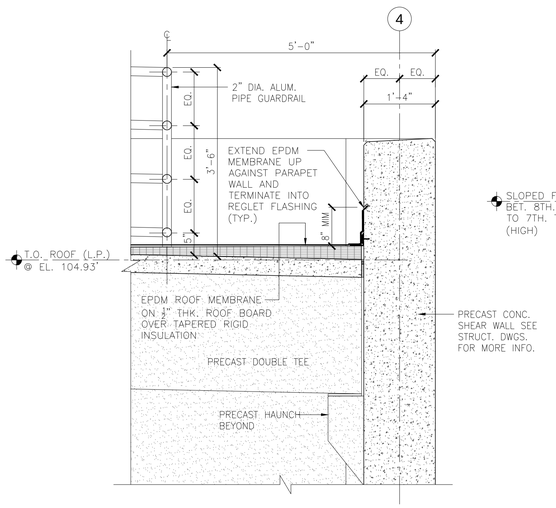
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

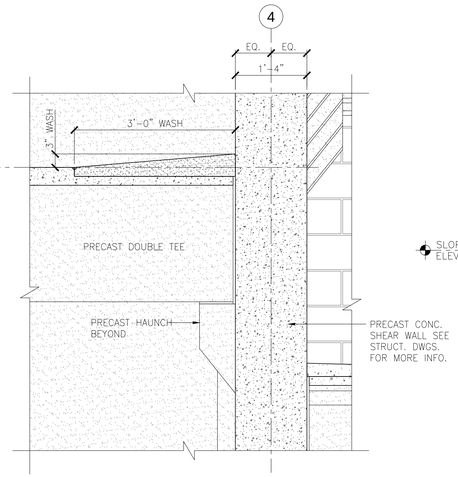
Drawing No.

A-230



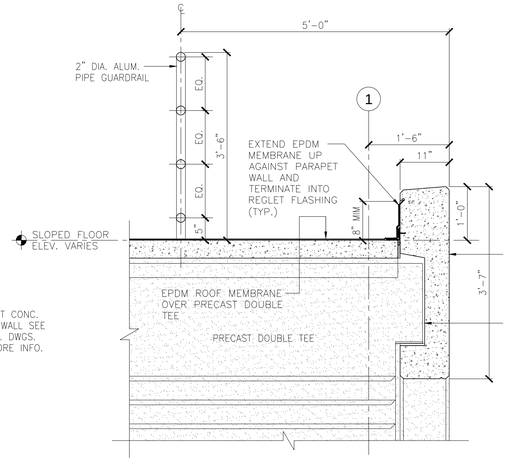
1 A-231 ENLARGED SPANDREL SECTION AT ROOF PARAPET ALONG COL. LINE - 4

SCALE: 3/4" = 1'-0"



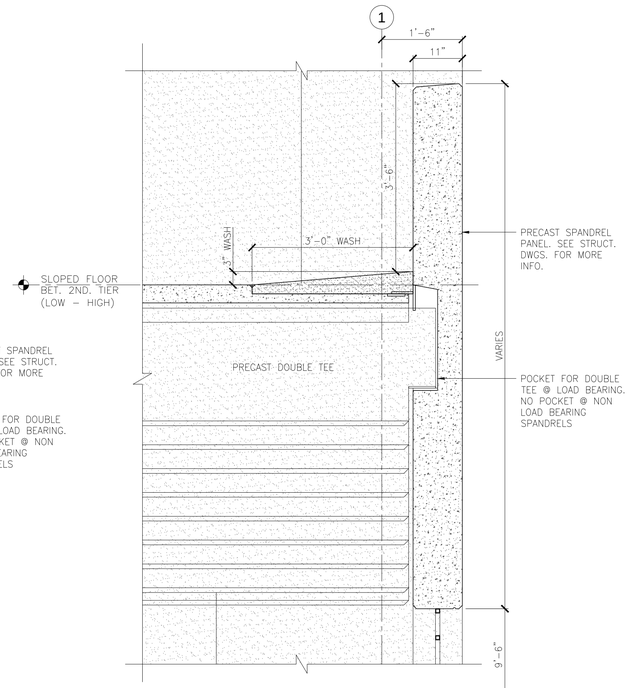
2 A-231 TYP. ENLARGE SPANDREL SECTION FROM 3RD - 7TH TIER ALONG COLUMN LINE 4 BETWEEN COLUMNS C & B

SCALE: 3/4" = 1'-0"



3 A-231 TYP. ENLARGE SPANDREL SECTION AT ROOF PARAPET ALONG COLUMN LINE - 1 BETWEEN COLUMNS B & D

SCALE: 3/4" = 1'-0"



4 A-231 ENLARGE SPANDREL SECTION ALONG COLUMN LINE - 1 BETWEEN COLUMNS B & D

SCALE: 3/4" = 1'-0"

5 A-231 ELEVATOR - C & STAIR - B BULKHEAD DETAIL

SCALE: 1 1/2" = 1'-0"

6 A-231 STAIR - B CORNICE DETAIL

SCALE: 1 1/2" = 1'-0"

7 A-231 ELEVATOR - C & STAIR - B BULKHEAD DETAIL

SCALE: 1 1/2" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLAGED SECTION DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

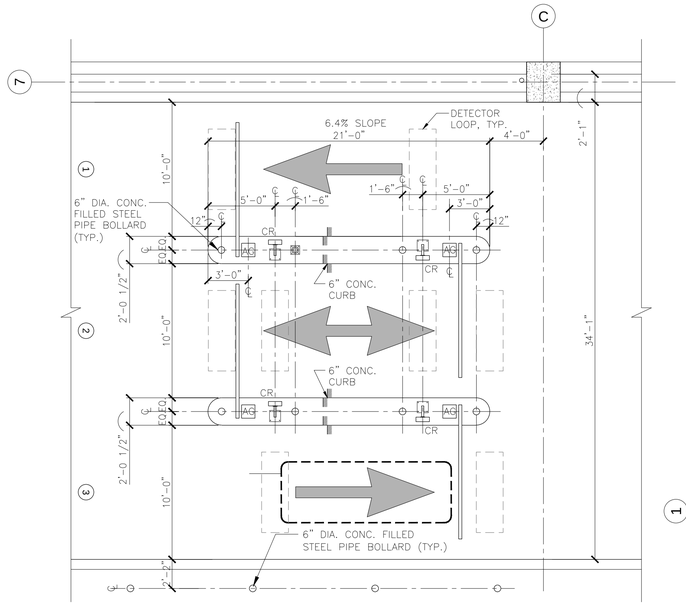
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

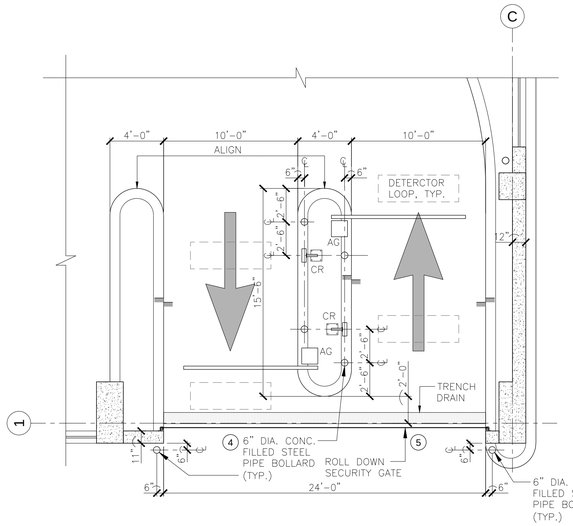
Drawing No.

A-231



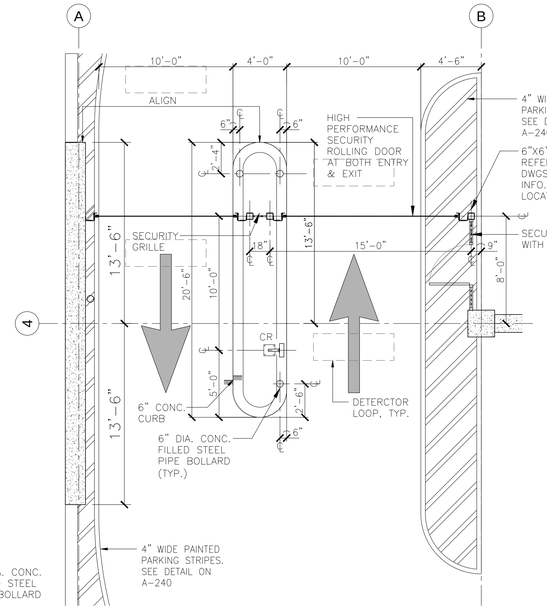
1 A-240 ENLARGED ENTRY/EXIT AT CALDWELL PLACE

SCALE: 3/16"=1'-0"



2 A-240 ENLARGED ENTRY/EXIT AT ELIZABETHTOWN PLAZA

SCALE: 3/16"=1'-0"



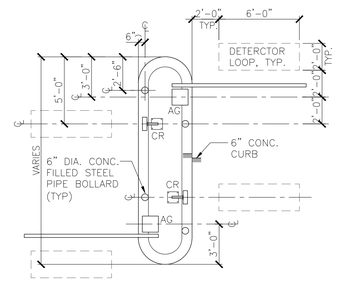
3 A-240 ENLARGED ENTRY/EXIT AT SEVENTH TIER - HIGH

SCALE: 3/16"=1'-0"

EQUIPMENT LEGEND:

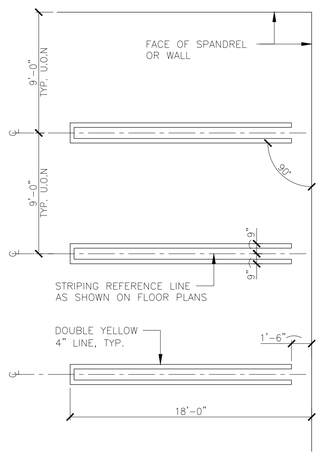
AG	AUTOMATIC GATE
CR	PROXIMITY CARD READER
	DETECTOR LOOP
1	LANE NUMBER (FOR REFERENCE ONLY, DO NOT PAIN)

NOTE:
VERIFY C.I.P ISLAND AND EQUIPMENT LOCATIONS WITH ARCHITECT PRIOR TO PLACING CONCRETE OR CONDUIT ROUGH-INS



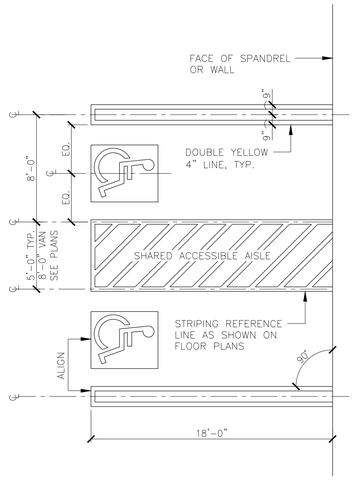
4 A-240 TYPICAL ENTRY/EXIT CONTROL DETAIL

SCALE: 3/16"=1'-0"



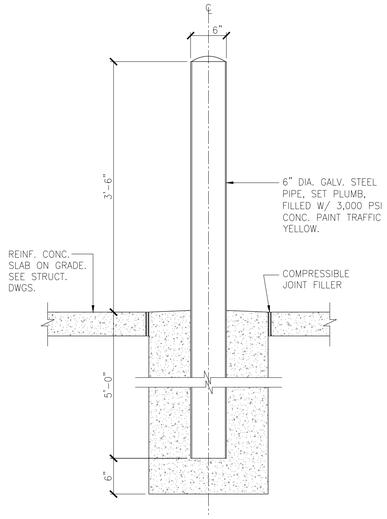
5 A-240 TYPICAL STRIPING DETAIL

SCALE: 3/16"=1'-0"



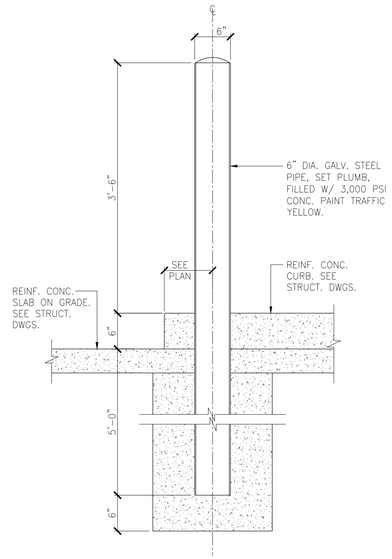
6 A-240 ACCESSIBLE STALL STRIPING DETAIL

SCALE: 3/16"=1'-0"



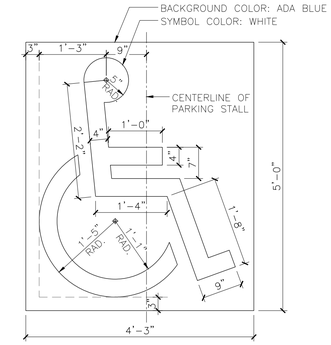
7 A-240 TYP. BOLLARD DETAIL ON GRADE

SCALE: 3/16"=1'-0"



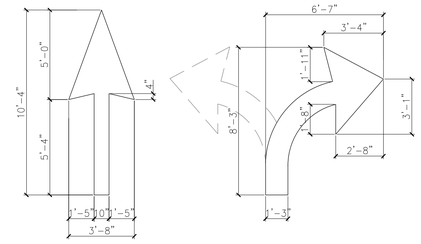
8 A-240 TYP. BOLLARD DETAIL ON GRADE WITH CONCRETE CURB

SCALE: 3/16"=1'-0"



9 A-240 ACCESSIBLE SYMBOL DETAIL

SCALE: 3/4"=1'-0"



10 A-240 PAINTED FLOOR ARROW DETAILS

SCALE: 1/4"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.777.2606
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLARGED PARKING EQUIPMENT PLANS & TYPICAL PLAN DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

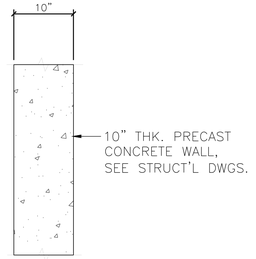
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

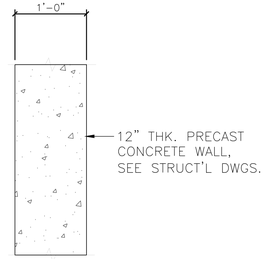
A-240

PARTITION NOTES:

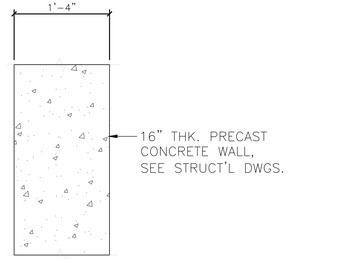
1. CONTRACTOR SHALL HAVE A NEW JERSEY LICENSED ENGINEER DESIGN THE INTERIOR PARTITION METAL FRAMING SYSTEM. THE ENGINEER IS TO SIGN AND SEAL THE METAL FRAMING SHOP DRAWINGS AND STRUCTURAL CALCULATIONS AND SHALL BE SUBMITTED TO ARCHITECT FOR REVIEW.
2. PROVIDE CROSS BRACING AS REQUIRED TO SUPPORT PARTITIONS. CROSS BRACING SHALL BE ATTACHED TO STRUCTURAL STEEL
3. GENERAL CONTRACTOR SHALL COORDINATE THE ATTACHMENT OF METAL FRAMING COMPONENTS TO STRUCTURAL STEEL WITH SPRAYED FIREPROOFING CONTRACTOR.
4. INSTALL WATER RESISTANT GYP. BD. AT ALL TOILET ROOMS. (WET SIDE) OF PARTITIONS ONLY. SEE PARTITION TYPES
5. REFER TO FINISH PLANS FOR SCHEDULED FINISHES
6. REFER TO STRUCTURAL DRAWINGS FOR CMU REBAR INFORMATION.



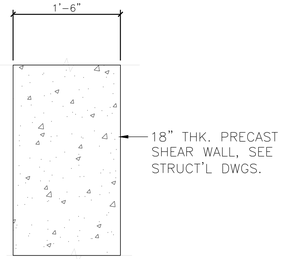
C10 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.



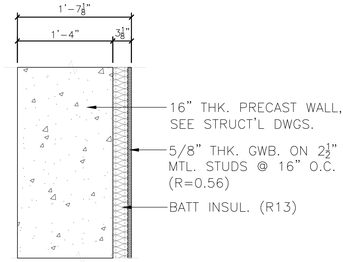
C12 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.



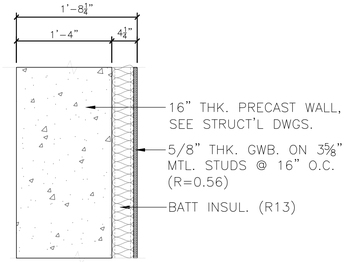
C16 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.



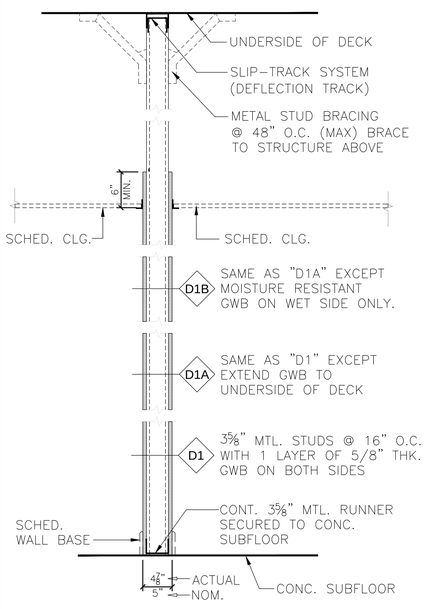
C18 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.



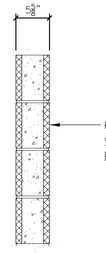
C16A — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.
TOTAL "R" VALUE = 13.56



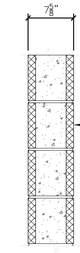
C16B — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
BASE ON TABLE 722.2.1.1 IN IBC 2018 NJ ED.
TOTAL "R" VALUE = 13.56



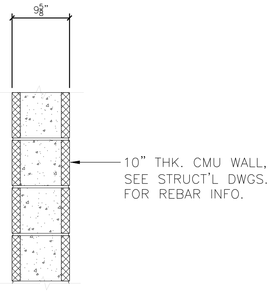
D1 — DRYWALL PARTITION TYPE
NON-RATED PARTITION



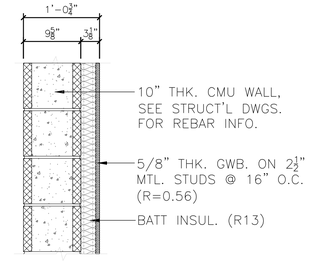
M6 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
UL DESIGN NO. U905 (2-HR FIRE-RATED)



M8 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
UL DESIGN NO. U905 (2-HR FIRE-RATED)



M10 — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
UL DESIGN NO. U905 (2-HR FIRE-RATED)



M10A — PRECAST CONC. WALL TYPE
2 - HOUR FIRE RATED WALL
UL DESIGN NO. U905 (2-HR FIRE-RATED)
TOTAL "R" VALUE = 13.56

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

WALL TYPES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-301

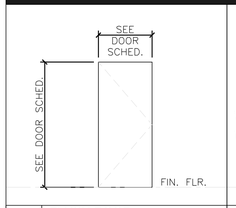
DOOR AND FRAME SCHEDULE

	DOOR NO.	DOOR LOCATION FROM	TO	DOOR WIDTH	HEIGHT	THK	MAT'L.	FIN	TYPE	GL	FRAME MAT'L.	FIN.	TYPE	JAMB	HEAD	SILL MAT'L.	TYPE	FIRE-RATING	HDWR. SET	REMARKS
FIRST TIER PLAN	100	BUS STOP WAITING AREA	VESTIBULE #100	(2)3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	1.0	
	100A	COUNTY VEHICLE PARKING	VESTIBULE #100	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1A	J2	H2	AL	S1	-	7.0	
	101	VESTIBULE #100	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	AL	S1	-	8.0	
	102	BUS WAITING AREA	FIRE PUMP ROOM	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1A	J2	H2	AL	S1	-	10.0	
	103	EMPLOYEE & JUDGES ENTRY-EXIT	MAIN ELECTRIC ROOM	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1A	J2	H2	AL	S1	-	4.0	
	104	EMPLOYEE & JUDGES ENTRY-EXIT	SHERIFF'S DEPARTMENT	4'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	2.0	
	105	SHERIFF'S DEPARTMENT	TOILET	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J1	H1	STONE	S2	-	12.0	
	106	SHERIFF'S DEPARTMENT	TRAFFIC CONTROL STORAGE	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J1	H1	-	S3	-	11.0	
	106A	EMPLOYEE & JUDGES ENTRY-EXIT	TRAFFIC CONTROL STORAGE	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J2	H2	-	S3	-	9.0	
	107	SHERIFF'S DEPARTMENT	TRAFFIC CONTROL STORAGE	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J1	H1	-	S3	-	11.0	
	108	SHERIFF'S DEPARTMENT	TRAFFIC CONTROL STORAGE	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J1	H1	-	S3	-	11.0	
	109	SHERIFF'S DEPARTMENT	TRAFFIC CONTROL STORAGE	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J1	H1	-	S3	-	11.0	
	110	LOBBY	E.C.R. (ELEV. CONTROL R.M.)	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4	H4	-	S1	-	9.0	
	111	BUILDING EXTERIOR	ELEVATOR LOBBY	3'-4"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	2.0	
	112	LOBBY	STAIR A	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	AL	S1	-	8.0	
	113	COUNTY VEHICLE PARKING	EMERGENCY ELECTRICAL ROOM	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1A	J2	H2	AL	S1	-	4.0	
	113A	BUILDING EXTERIOR	COUNTY VEHICLE PARKING	3'-0"	7'-0"	-	STL	DP1	*	-	W.I.	DP1	*	-	-	-	-	-	13.0	
	113B	BUILDING EXTERIOR	COUNTY VEHICLE PARKING	24'-0"	9'-6"	*	S/STL	*	CG	-	S/STL	*	*	J6	H6	-	-	-	13.0	
	114	COUNTY VEHICLE PARKING	STORAGE ROOM	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1A	J2/J3	H2	AL	S1	-	5.0	
	115	BUILDING EXTERIOR	EMPLOYEE & JUDGES ENTRY-EXIT	3'-0"	7'-0"	-	STL	DP1	*	-	W.I.	DP1	*	-	-	-	-	-	13.0	
	115A	BUILDING EXTERIOR	EMPLOYEE & JUDGES ENTRY-EXIT	34'-1	9'-1 1/2"	*	S/STL	*	CG	-	S/STL	*	*	J6	H6	-	-	-	13.0	
SECOND TIER PLAN	200	PARKING AREA	E.C.R. (ELEV. CONTROL R.M.)	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4	H4	AL	S1	-	10.0	
	201	PARKING AREA	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	AL	S1	-	8.0	
	202	PARKING AREA	WATER VALVE RM.	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4	H4	AL	S1	-	10.0	
THIRD TIER PLAN	300	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	300A	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	301	PARKING AREA	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	-	-	-	8.0	
	302	PARKING AREA	WATER VALVE RM.	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4A	H4A	-	-	-	10.0	
	303	PARKING AREA	ELEVATOR LOBBY	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	3.0	
	304	ELEVATOR LOBBY	STAIR A	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	-	-	3.0	
FOURTH TIER PLAN	400	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	400A	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	401	PARKING AREA	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	-	-	-	8.0	
	402	PARKING AREA	WATER VALVE RM.	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4A	H4A	-	-	-	10.0	
	403	PARKING AREA	ELEVATOR LOBBY	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	3.0	
	404	ELEVATOR LOBBY	STAIR A	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	-	-	3.0	
5TH & 6TH TIER PLAN	500	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	500A	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	501	PARKING AREA	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	-	-	-	8.0	
	502	PARKING AREA	WATER VALVE RM.	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4A	H4A	-	-	-	10.0	
	503	PARKING AREA	ELEVATOR LOBBY	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	3.0	
	504	ELEVATOR LOBBY	STAIR A	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	-	-	3.0	
SEVENTH TIER PLAN	700	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	700A	PARKING AREA	ELECTRICAL CLOSET	(2)3'-0"	7'-0"	1 3/4"	H.M.	DP1	FL1	-	H.M.	DP1	1	J4A	H4A	-	-	-	6.0	
	701	PARKING AREA	STAIR B	3'-0"	7'-0"	1 3/4"	H.M.	DP1	FV1	-	H.M.	DP1	1	J3	H3	-	-	-	8.0	
	702	PARKING AREA	WATER VALVE RM.	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4A	H4A	-	-	-	10.0	
	703	7TH TIER HIGH	7TH TIER LOW	12'-0"	8'-9"	*	G/STL	*	CD	*	AL	*	*	*	*	AL	S1	-	3.0	
	704	7TH TIER HIGH	7TH TIER LOW	12'-0"	8'-9"	*	G/STL	*	CD	*	AL	*	*	*	*	AL	-	-	3.0	
	705	7TH TIER HIGH	7TH TIER HIGH	3'-0"	7'-0"	*	STL	DP1	SG	-	*	*	*	*	*	-	-	-	-	SEE DWG. SG7/A-322
8TH TIER PLAN	800	PARKING AREA	ELEVATOR LOBBY	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	S1	-	3.0	
	801	ELEVATOR LOBBY	STAIR A	3'-0"	7'-0"	*	AL/GL	*	1G	*	AL	*	*	*	*	AL	-	-	3.0	
	802	PARKING AREA	LOW ROOF	3'-0"	7'-0"	1 3/4"	H.M.	DP1	F	-	H.M.	DP1	1	J4A	H4A	-	-	-	11.1	

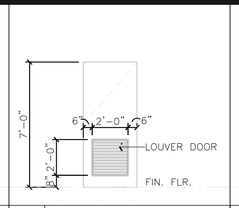
DOOR SCHEDULE ABBREVIATIONS

AL/GL	ALUMINUM/GLASS	**RB**	RUBBER
CD	COILING DOOR	**SG**	SECURITY GATE
CG	COILING GRILL	**STL.**	STEEL
CLR	CLEAR	**S/STL**	STAINLESS STEEL
DP1	DOOR PAINT SEE FIN. SCHED.	**ST**	STONE
FRP	FIBERGLASS REINFORCED POLYESTER	**T**	TEMPERED GLASS
GL	GLASS	**WD**	WOOD
G/STL	GALVANIZED STEEL	**WT**	WIRED TEMPERED GLASS
H.M.	HOLLOW METAL	**X.H.M.**	EXIST. HOLLOW MTL FRAME TO REMAIN
P1	PAINT - SEE FIN. SCHED.	*	REFER TO SPECIFICATIONS FOR HARDWARE SETS

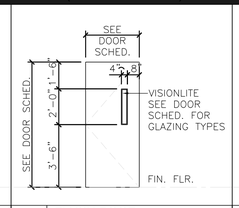
DOOR TYPE SCHEDULE (SCALE: 1/4" = 1'-0")



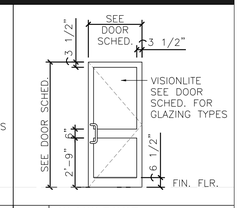
F FLUSH DOOR



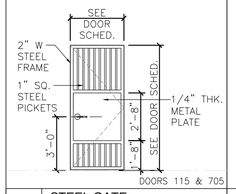
FL1 FLUSH DOOR WITH LOUVER



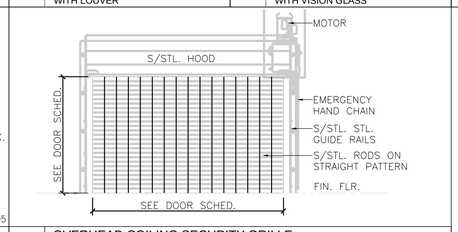
FV1 FLUSH DOOR WITH VISION GLASS



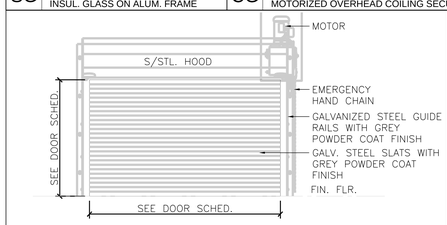
1G GLASS DOOR
INSUL. GLASS ON ALUM. FRAME



SG STEEL GATE
INSUL. GLASS ON ALUM. FRAME

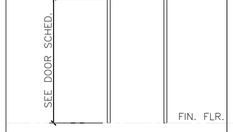


CG OVERHEAD COILING SECURITY GRILLE
MOTORIZED OVERHEAD COILING SECURITY GRILL



CD OVERHEAD COILING DOOR
MOTORIZED OVERHEAD COILING DOOR

DOOR FRAME TYPE SCHEDULE (SCALE: 1/4" = 1'-0")



1 H.M. DOOR FRAME
STUD WALL APPLICATION

1A H.M. DOOR FRAME
CMU WALL APPLICATION

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10001
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

DOOR AND FRAME SCHEDULE, DOOR & DOOR FRAME TYPE SCHEDULES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

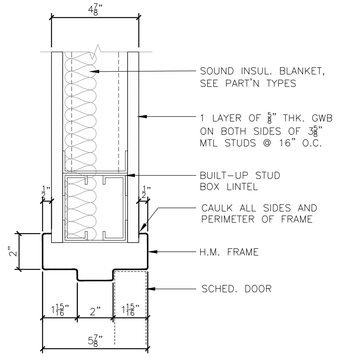
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

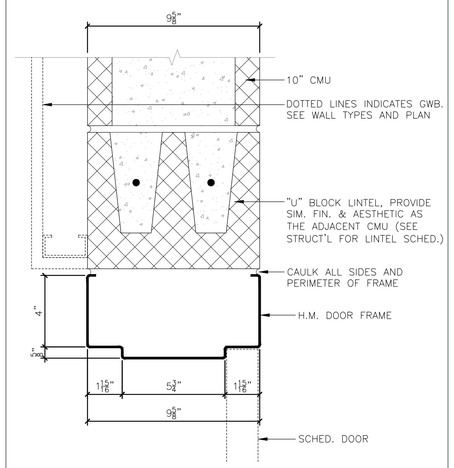
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

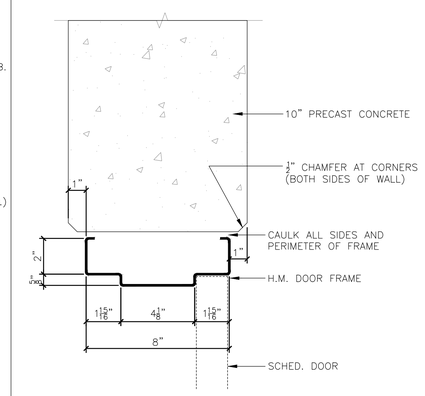
A-311



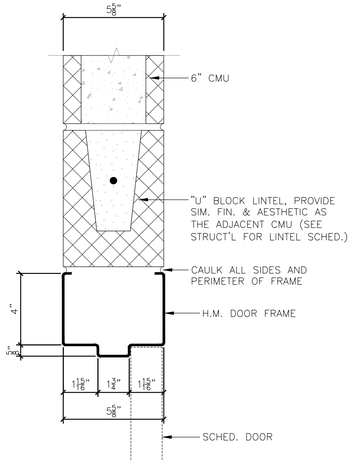
H1 HEAD DETAIL
SCALE: 3" = 1'-0"



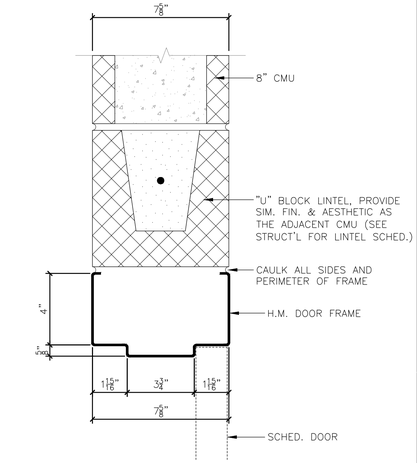
H2 HEAD DETAIL
SCALE: 3" = 1'-0"



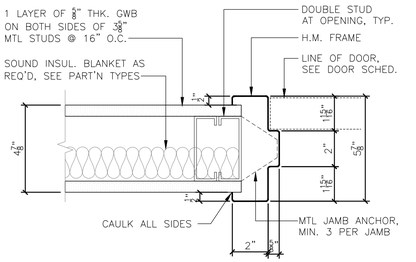
H3 HEAD DETAIL
SCALE: 3" = 1'-0"



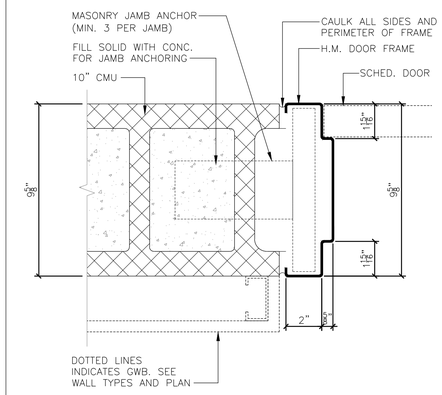
H4 HEAD DETAIL
SCALE: 3" = 1'-0"



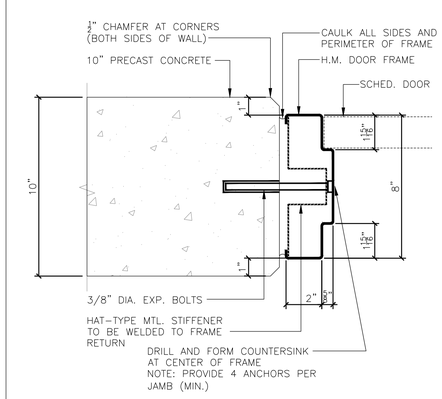
H4A HEAD DETAIL
SCALE: 3" = 1'-0"



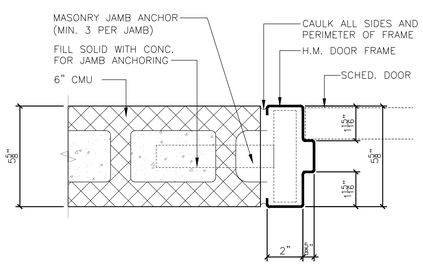
J1 JAMB DETAIL
SCALE: 3" = 1'-0"



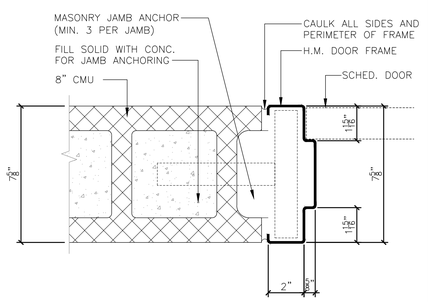
J2 JAMB DETAIL
SCALE: 3" = 1'-0"



J3 JAMB DETAIL
SCALE: 3" = 1'-0"

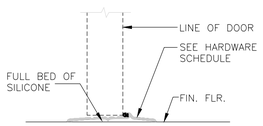


J4 JAMB DETAIL
SCALE: 3" = 1'-0"

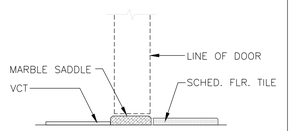


J4A JAMB DETAIL
SCALE: 3" = 1'-0"

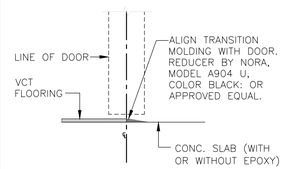
DOOR SILL TYPE SCHEDULE (SCALE: 3" = 1'-0")



S1 ALUMINUM SADDLE
EXTERIOR DOOR



S2 STONE SADDLE
VCT TO FLOOR TILE



S3 TRANSITION MOLDING
FLOOR TILE TO CONCRETE

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

DOOR DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

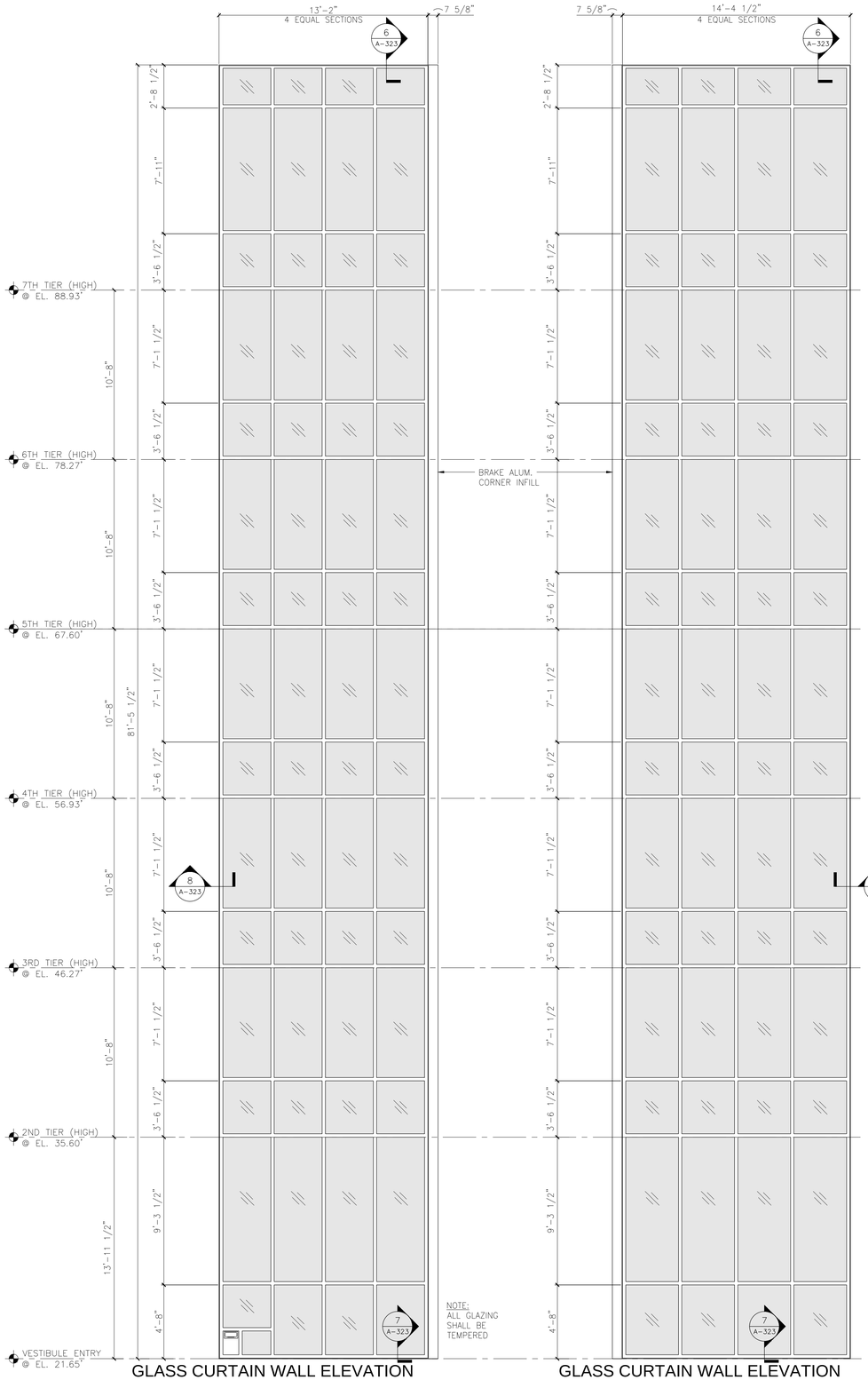
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

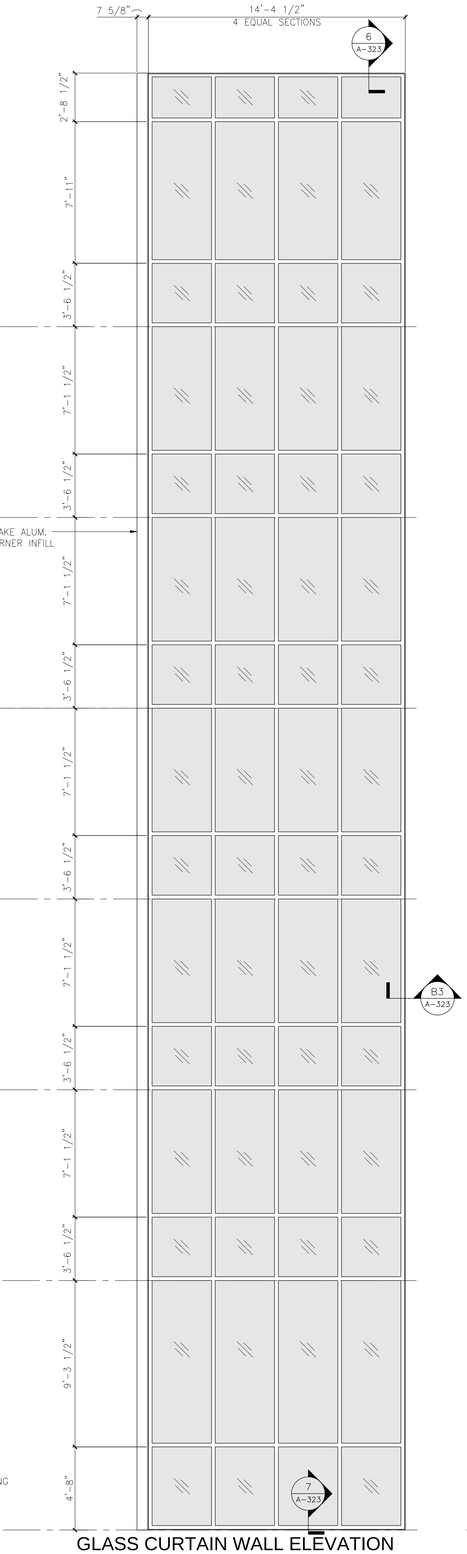
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

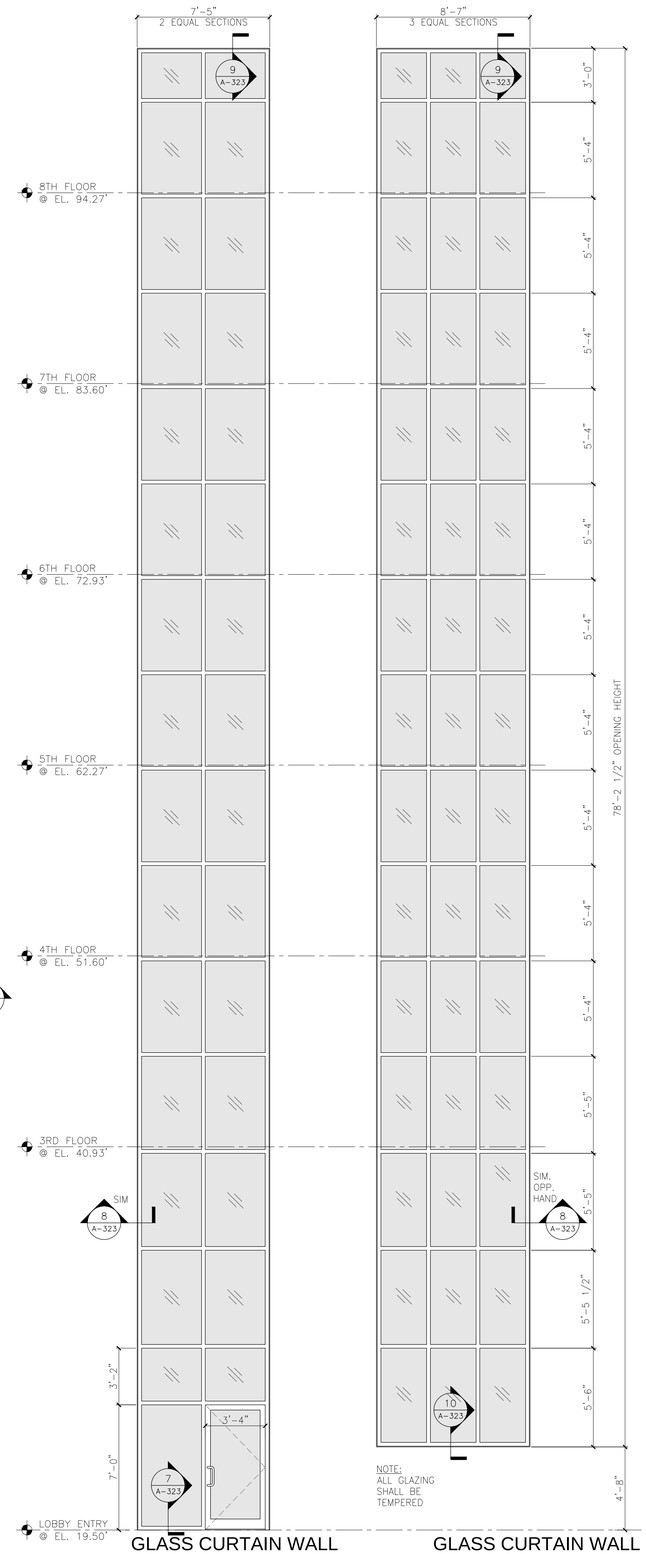
A-312



CW1 GLASS CURTAIN WALL ELEVATION AT STAIR -B FACING CALDWELL PLACE
SCALE: 1/4" = 1'-0"

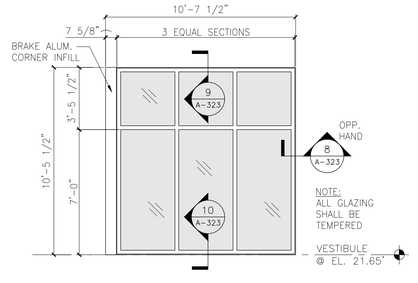


CW2 GLASS CURTAIN WALL ELEVATION AT STAIR -B FACING ELIZABETHTOWN PLAZA
SCALE: 1/4" = 1'-0"

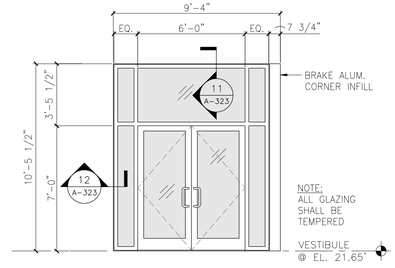


CW3 GLASS CURTAIN WALL ELEVATION AT STAIR - A
SCALE: 1/4" = 1'-0"

CW4 GLASS CURTAIN WALL ELEVATION AT STAIR - A
SCALE: 1/4" = 1'-0"



CW6 GLASS CURTAIN WALL ELEVATION AT VESTIBULE FACING CALDWELL PLACE
SCALE: 1/4" = 1'-0"



CW5 GLASS CURTAIN WALL ELEVATION AT VESTIBULE FACING BUS STOP WAITING AREA
SCALE: 1/4" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2080
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CURTAIN WALL ELEVATIONS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

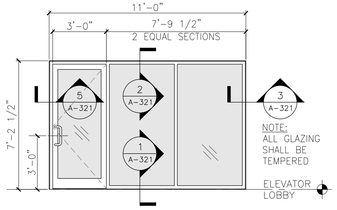
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

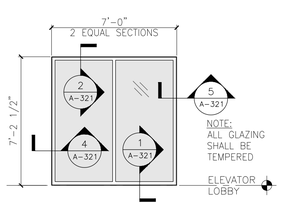
Drawing No.

A-320



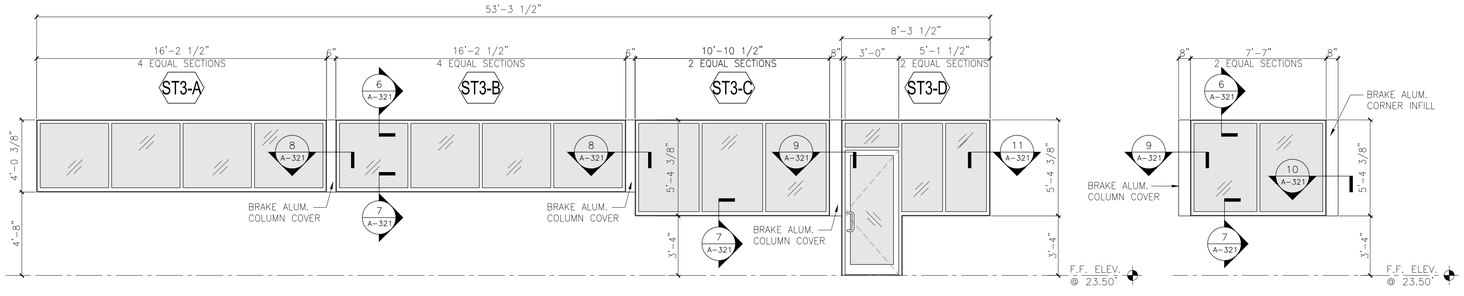
ST1 TYP. GLASS STOREFRONT ELEV. @ ELEVATOR A & B LOBBY

SCALE: 1/4" = 1'-0"



ST2 TYP. GLASS STOREFRONT ELEV. @ ELEVATOR A & B LOBBY

SCALE: 1/4" = 1'-0"



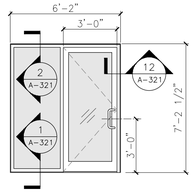
ST3 GLASS STOREFRONT ELEVATION AT SHERIFF'S DEPARTMENT

SCALE: 1/4" = 1'-0"

ST4 GLASS STOREFRONT ELEV. AT SHERIFF'S DEPT.

SCALE: 1/4" = 1'-0"

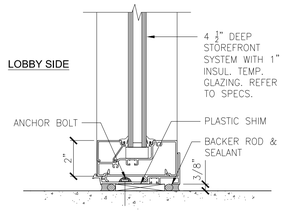
TYP AT 3RD - 8TH TIER ELEVATOR AND STAIR - A LOBBY



ST5 GLASS STOREFRONT ELEVATION

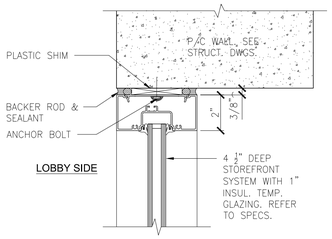
SCALE: 1/4" = 1'-0"

TYP AT 3RD - 8TH TIER ELEVATOR AND STAIR - A LOBBY



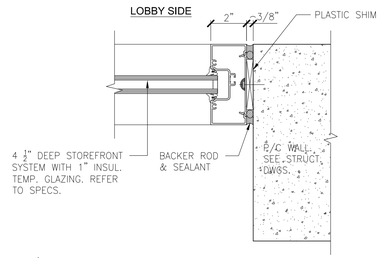
1 A-321 STOREFRONT SILL DETAIL

SCALE: 3" = 1'-0"



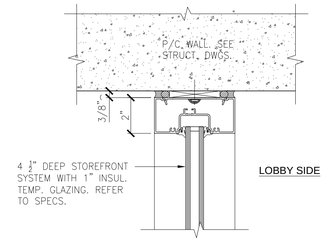
2 A-323 STOREFRONT HEAD DETAIL

SCALE: 3" = 1'-0"



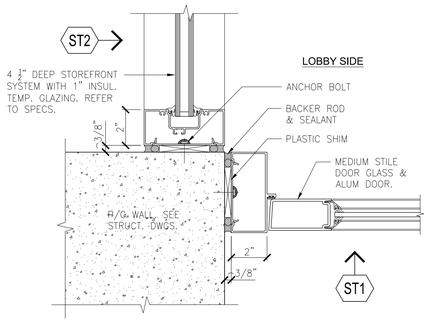
3 A-323 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



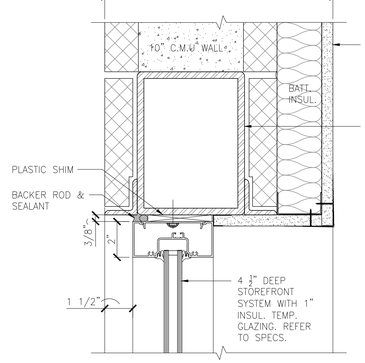
4 A-323 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



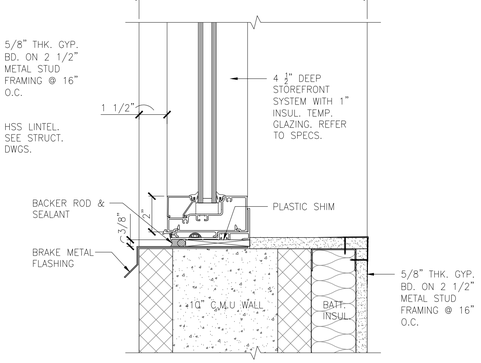
5 A-323 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



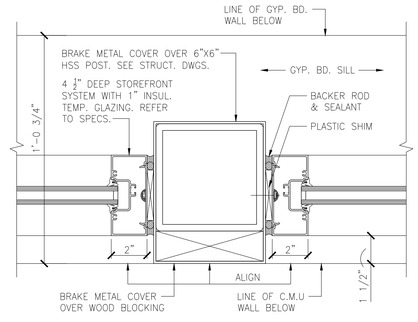
6 A-321 STOREFRONT HEAD DETAIL

SCALE: 3" = 1'-0"



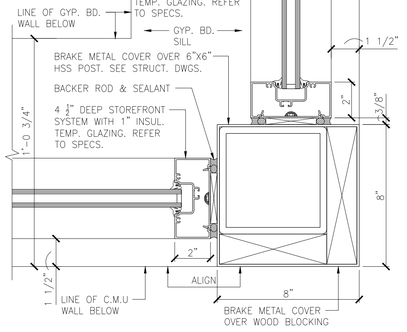
7 A-321 STOREFRONT HEAD DETAIL

SCALE: 3" = 1'-0"



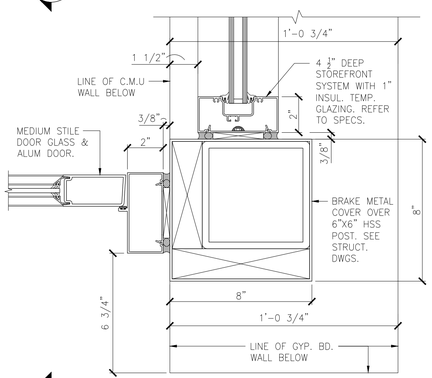
8 A-321 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



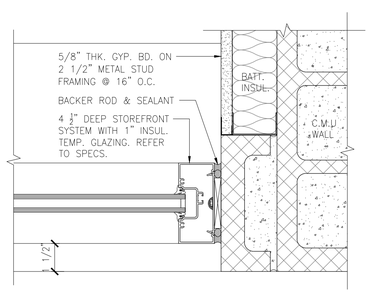
9 A-321 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



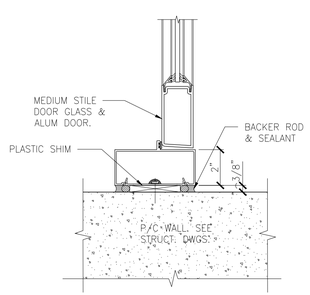
10 A-321 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



11 A-321 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"



12 A-321 STOREFRONT JAMB DETAIL

SCALE: 3" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
nnarchitects@gmail.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

STOREFRONT ELEVATIONS AND DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

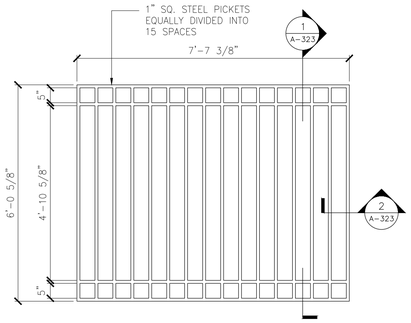
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

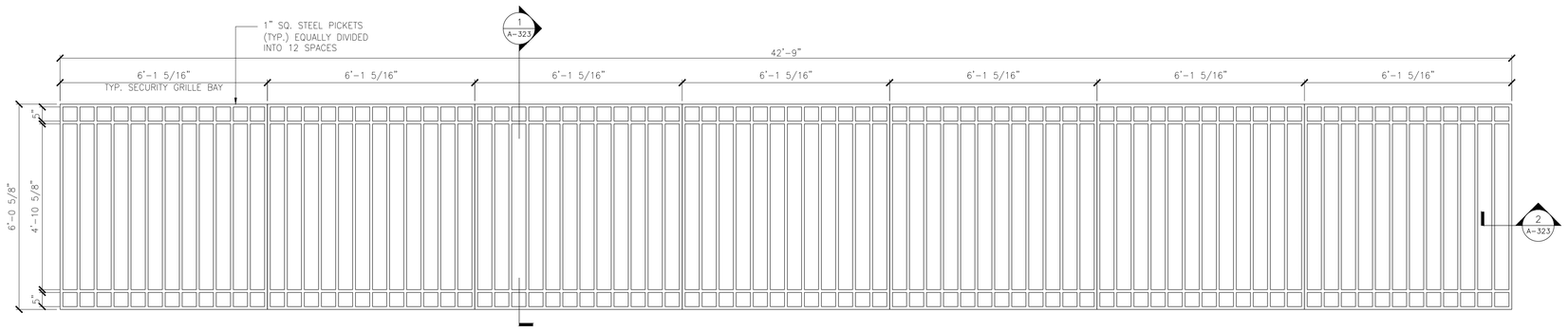
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

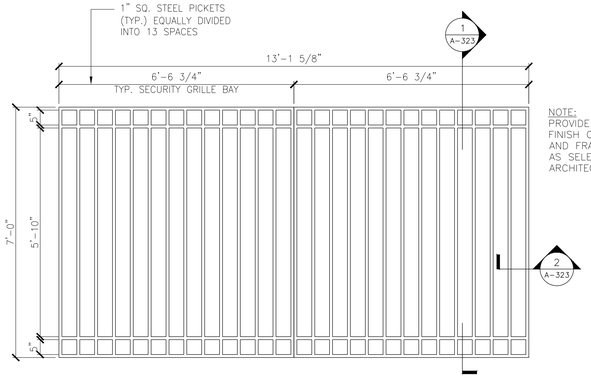
A-321



SG1 SECURITY GRILLE ELEVATION
SCALE: 1/2" = 1'-0"

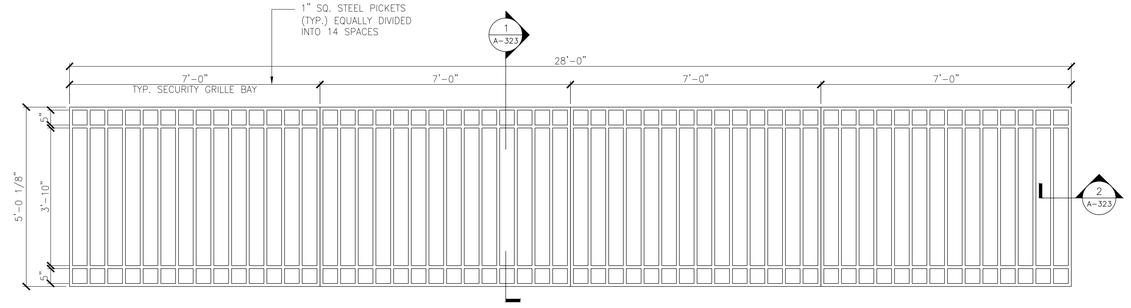


SG2 SG3 SECURITY GRILLE ELEVATION
SCALE: 1/2" = 1'-0"

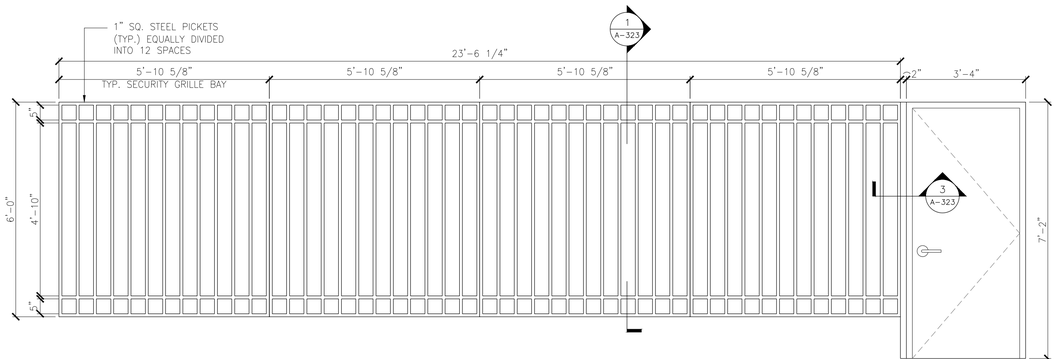


NOTE:
PROVIDE A KYNAR FINISH ON THE GATE AND FRAME IN COLOR AS SELECTED BY THE ARCHITECT

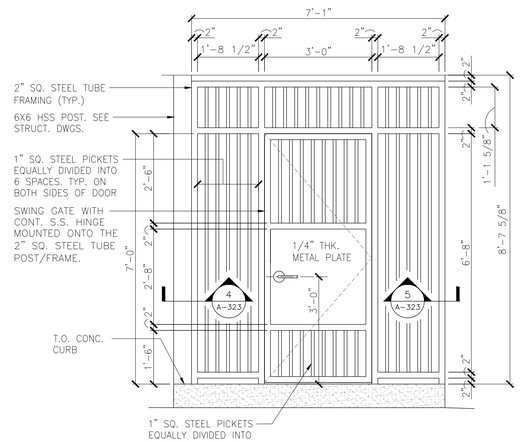
SG4 SECURITY GRILLE ELEVATION
SCALE: 1/2" = 1'-0"



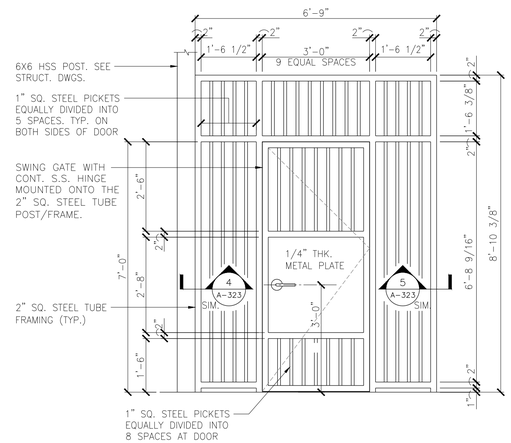
SG5 SECURITY GRILLE ELEVATION
SCALE: 1/2" = 1'-0"



SG6 SECURITY GRILLE ELEVATION
SCALE: 1/2" = 1'-0"



SG7 SECURITY GRILLE WITH GATE ELEVATION
SCALE: 1/2" = 1'-0"



SG8 SECURITY GRILLE WITH GATE ELEVATION AT SEVENTH TIER - HIGH
SCALE: 1/2" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECURITY GRILLE ELEVATIONS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

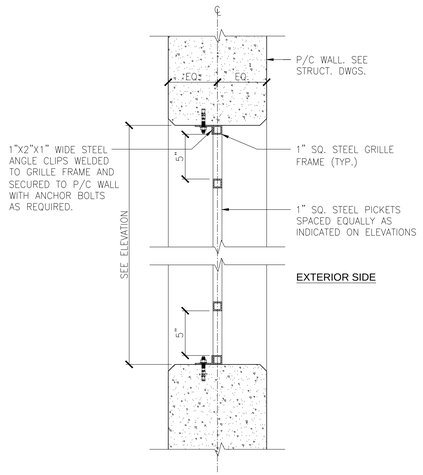
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

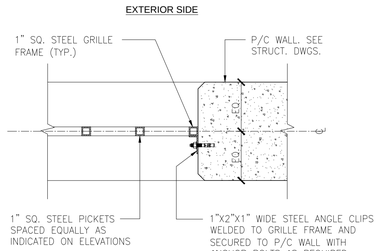
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

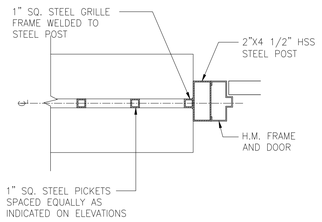
A-322



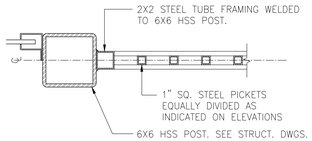
1 A-323 SECURITY GRILLE HEAD & SILL DETAIL
SCALE: 1 1/2" = 1'-0"



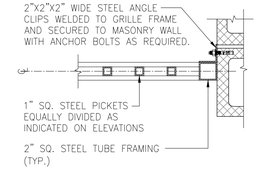
2 A-323 SECURITY GRILLE JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



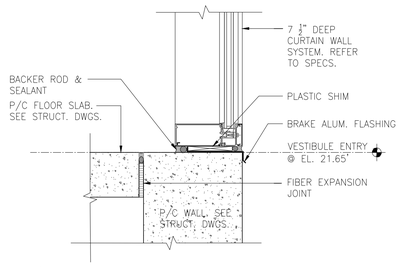
3 A-323 SECURITY GRILLE JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



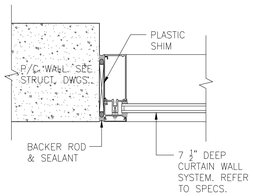
4 A-323 SECURITY GRILLE WITH GATE PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



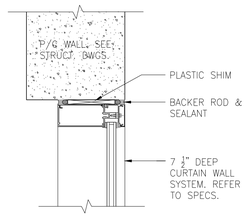
5 A-323 SECURITY GRILLE WITH GATE PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



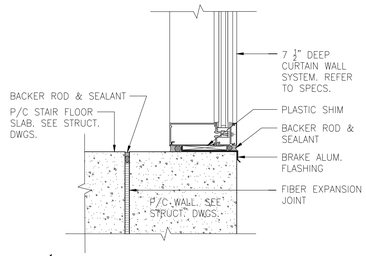
7 A-323 CURTAIN WALL SILL DETAIL
SCALE: 1 1/2" = 1'-0"



8 A-323 CURTAIN WALL JAMB DETAIL
SCALE: 1 1/2" = 1'-0"

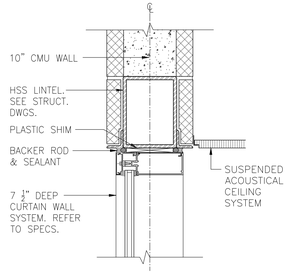


9 A-323 CURTAIN WALL SILL DETAIL
SCALE: 1 1/2" = 1'-0"

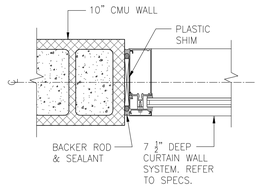


10 A-323 CURTAIN WALL SILL DETAIL
SCALE: 1 1/2" = 1'-0"

6 A-323 CURTAIN WALL HEAD DETAIL
SCALE: 1 1/2" = 1'-0"



11 A-323 CURTAIN WALL HEAD DETAIL
SCALE: 1 1/2" = 1'-0"



12 A-323 CURTAIN WALL JAMB DETAIL
SCALE: 1 1/2" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

CURTAIN WALL AND SECURITY GRILLE DETAILS

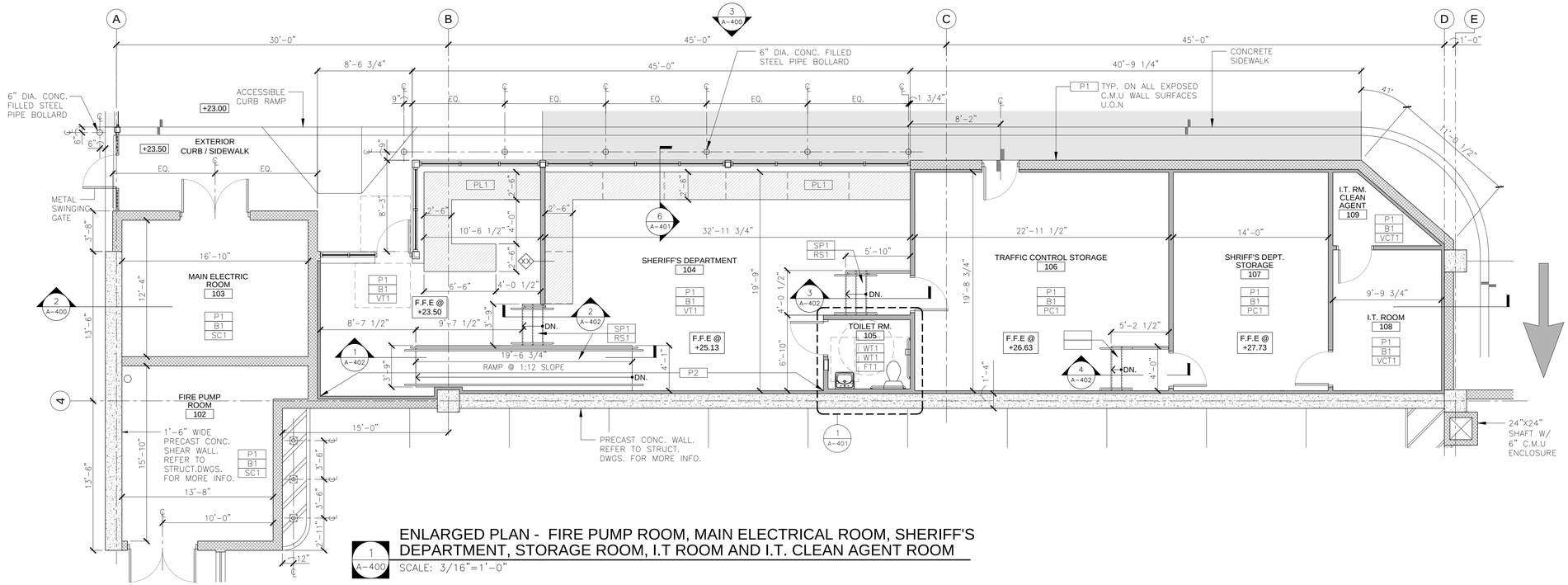
PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

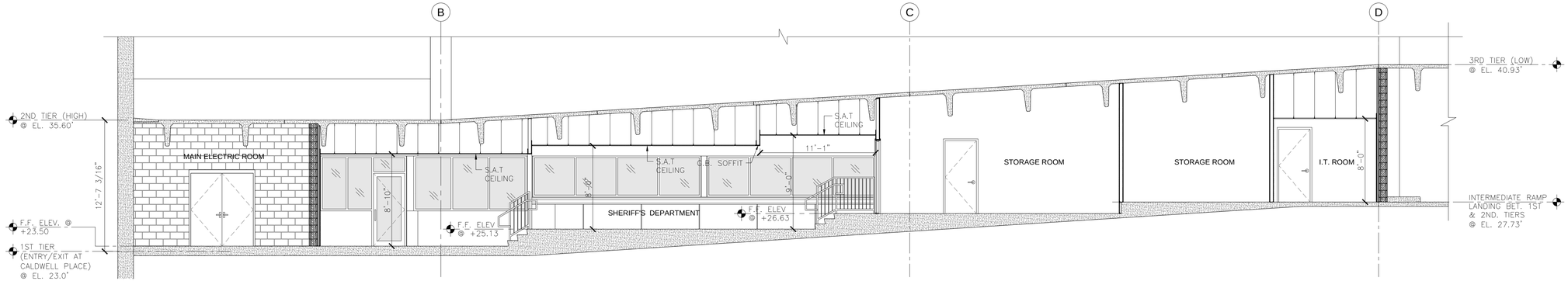
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565
Drawing No.	A-323



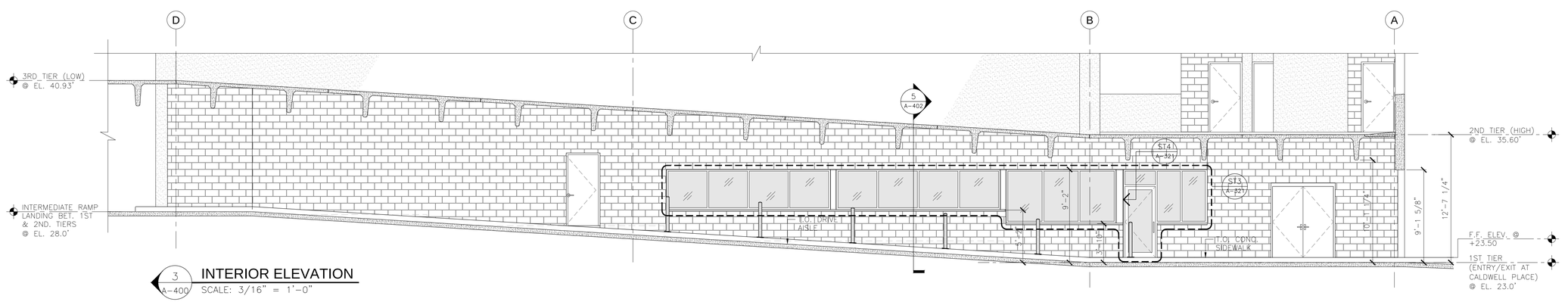
1 A-400 ENLARGED PLAN - FIRE PUMP ROOM, MAIN ELECTRICAL ROOM, SHERIFF'S DEPARTMENT, STORAGE ROOM, I.T ROOM AND I.T. CLEAN AGENT ROOM

SCALE: 3/16"=1'-0"



2 A-400 INTERIOR SECTION

SCALE: 3/16" = 1'-0"



3 A-400 INTERIOR ELEVATION

SCALE: 3/16" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLARGED PLANS, SECTION & ELEV. - FIRE PUMP RM., MAIN ELEC. RM., SHERIFF'S DEPT., STORAGE RM., I.T. & I.T. CLEAN AGENT RM.

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

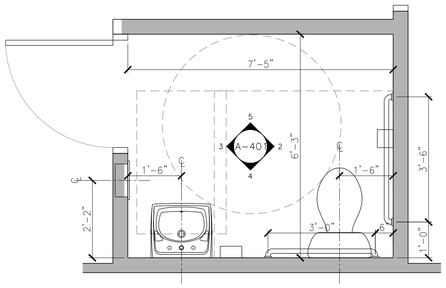
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

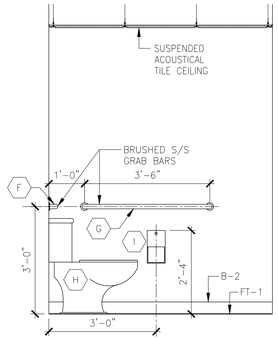
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

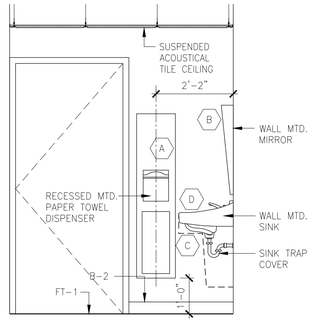
A-400



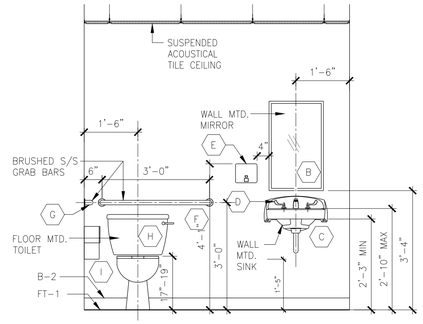
1 A-401 ENLARGED TOILET ROOM PLAN
SCALE: 1/2"=1'-0"



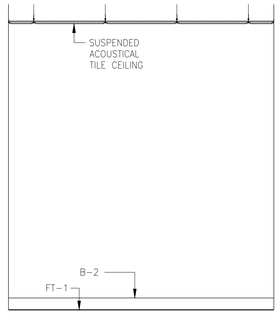
2 A-401 TOILET ROOM ELEVATION
SCALE: 1/2" = 1'-0"



3 A-401 TOILET ROOM ELEVATION
SCALE: 1/2" = 1'-0"



4 A-401 TOILET ROOM ELEVATION
SCALE: 1/2" = 1'-0"



5 A-401 TOILET ROOM ELEVATION
SCALE: 1/2" = 1'-0"

TOILET ROOM PLUMBING FIXTURE AND ACCESSORIES SCHEDULE:

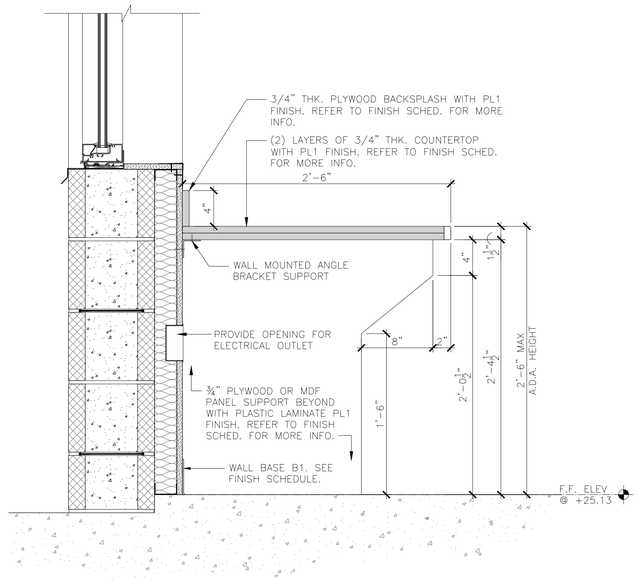
ITEM	DESCRIPTION	MANUF.	MODEL NO./	FINISH	REMARKS
A	RECESSED MOUNTED PAPER TOWEL DISPENSER/WASTE RECEPTACLE	BOBRICK	B-38034	SATIN S.S.	
B	SURFACE MOUNTED TILT MIRROR	BOBRICK	B-293 1830	SATIN S.S.	
C	AMERICAN STANDARD, WALL HUNG LAVATORY	AMERICAN STANDARD	LUCERNE 0356.015	WHITE	
D	TWO HANDLE 8" WIDESPREAD LAVATORY FAUCET WITH CONVENTIONAL SPOUT	AMERICAN STANDARD	MONTERREY 6501.170	SATIN NICKEL (295)	
E	SOAP DISPENSER FOR LIQUID AND LOTION SOAPS AND DETERGENTS, SURFACE MTD.	BOBRICK	B-2112 CLASSIC SERIES	SATIN S.S.	
F	1 ½" DIA. GRAB BAR	BOBRICK	B-6806x36 3'-0" LONG	SATIN S.S.	
G	1 ½" DIA. GRAB BAR	BOBRICK	B-6806x42 3'-6" LONG	SATIN S.S.	
H	KOHLER FLOOR MOUNTED TOILET	KOHLER	K-3519, HIGHLINE CLASSIC	WHITE	PROVIDE (1) KOHLER K-4666C OPEN FRONT SEAT
I	TOILET TISSUE MULTI-ROLL DISPENSER	BOBRICK	B-4288 CONTURA SERIES	SATIN S.S.	SURFACE MOUNTED

FINISH SCHEDULE

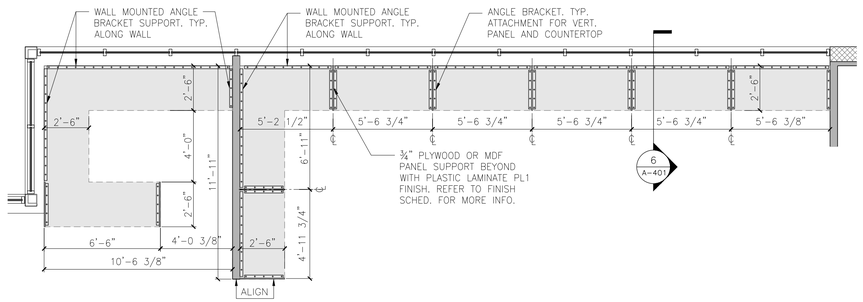
	MATERIAL	TYPE	DESCRIPTION	BASE OF DESIGN MANUFACTURER	CONTACT	REMARKS
FLOOR	VINYL COMPOSITION TILE	VCT1	3.2 MM OVERALL THICKNESS. EXCELON SDT VCT. SIZE: 12"X12". COLOR: MARBLE BEIGE 51950.	ARMSTRONG FLOORING	JENNIFER WALL 609.947.3626	
	VINYL TILE	VT1	3.2 MM OVERALL THICKNESS. 12"X12". COLLECTION: 1346V ADMIX. COLOR: 00720 DOVE SHELL WITH COORDINATING WELD RODS.	PATCRAFT	PERRY CIRIGLIANO 201.400.0427	
	PORCELAIN TILE	FT1	6"X36"X3/8" PORCELAIN TILE. COLLECTION: NEST. COLOR: AV355 PEACEFULL OAK. FINISH: UPS.	CROSSVILLE TILE	GINA VANARELLI TEL: 201.486.5006	
	POLISHED CONCRETE	PC1	DIAMOND POLISHED CONCRETE WITH GEMTONE STAIN, APPLY LS AND LS GUARD. CUSTOM BLEND STAINS.	CONSOLIDECK		
	SEALED CONCRETE	SC1	ASHFORD FORMULA	CURE CRETE, INC.	TEL: 801.489.5663	
BASE	RUBBER	B1	4" RUBBER WALL BASE COLOR: 121 CEMENT.	JOHNSONITE	KAREN LEVEY-LYNCH TEL: 917.797.5697	
WALL	PAINT	P1	ULTRA SPEC SCUFF-X INTERIOR LATEX PAINT. EGGSHELL FINISH. COLOR: 1465 NIMBUS.	BENJAMIN MOORE		
		P2	ULTRA SPEC SCUFF-X INTERIOR LATEX PAINT. EGGSHELL FINISH. COLOR: HC-156 VAN DEUSEN BLUE.	BENJAMIN MOORE		
		P3	ULTRA SPEC ELASTOMERIC WATERPROOF COATING LOW LUSTRE 0360. COLOR: 1467 BALTIC GRAY.	BENJAMIN MOORE		APPLY 2 COATS OF ACRYLIC BLOCK FILL PRIMER FOLLOWED BY 2 COATS OF PAINT.
	CERAMIC TILE	WT1	6"X6" CERAMIC WALL TILE. COLLECTION: METRO. COLOR: LUXE GREY. FINISH: GLOSSY	NEMO TILE	CARRIE BOCCI TEL: 609.744.9340	BACKSPLASH
CEILING	ACOUSTIC CEILING PANEL	ACT1				REFER TO SHEET A-600 FOR INFORMATION
	PAINT	CP1	ULTRA SPEC SCUFF-X INTERIOR LATEX PAINT. FLAT FINISH. COLOR: OC-152 SUPER WHITE.	BENJAMIN MOORE		TYPICAL ON ALL HOLLOW METAL DOORS AND FRAMES
DOOR & DOOR FRAME	METAL DOOR & METAL FRAME PAINT	DP1	ULTRA SPEC SCUFF-X INTERIOR LATEX PAINT. SEMI GLOSS FINISH. COLOR: 1467 BALTIC GRAY.	BENJAMIN MOORE		
STAIR & RAMP	RAILING, GUARDRAIL & STRINGER	SP1	ULTRA SPEC SCUFF-X INTERIOR LATEX PAINT. SEMI GLOSS FINISH. COLOR: 1467 BALTIC GRAY.	BENJAMIN MOORE		
	STAIR TREAD / RISER / LANDING	RS1	ONE-PIECE NOSING-TREAD-RISER RUBBER STAIRTREADS. STYLE: NORAMENT SATURA. COLOR: 5108 INDUS.	NORA	TORY CHURCHILL 201.661.3514	
MILLWORK		PL1	4943-38 CLASSIC LINEN	WILSONART	KYLE LEGEMAAT 856.571.4142	

FINISH LEGEND:

- P1 — WALL FINISH
- B1 — BASE FINISH
- CT1 — FLOOR FINISH
- CHANGE IN FLOOR FINISH
- W-1 — WINDOW TREATMENT
- DIRECTION OF SPECIFIED MATERIAL



6 A-401 MILLWORK DETAIL
SCALE: 1 1/2" = 1'-0"



7 A-402 SHERIFF'S DEPARTMENT MILLWORK PLAN DETAIL
SCALE: 1/4"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SHERIFF'S DEPARTMENT ENLARGED TOILET ROOM PLAN, ELEVATIONS, PLUMBING & ACCESSORIES SCHEDULE, FINISH SCHEDULE & MILLWORK DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

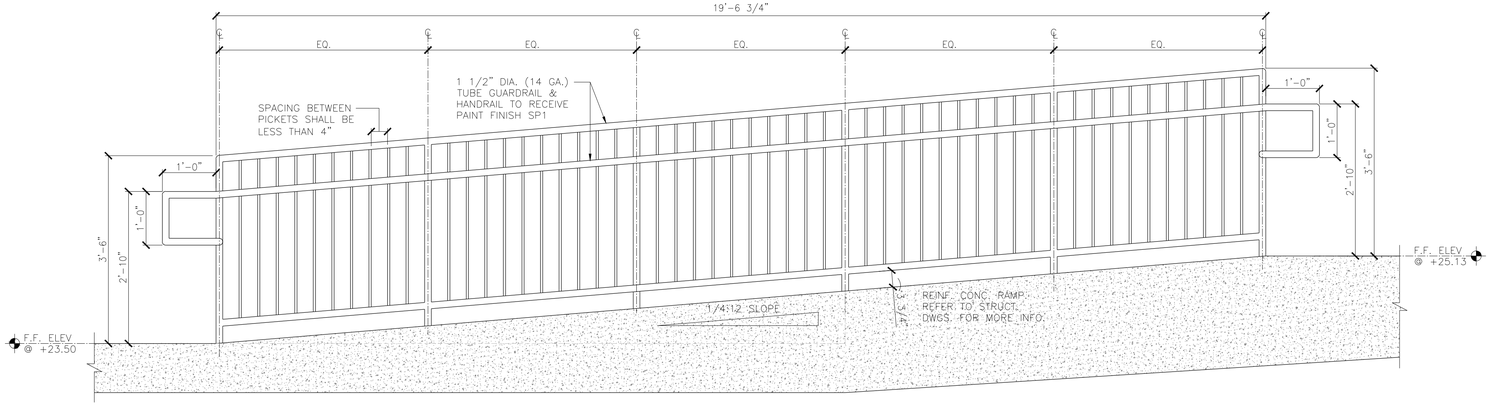
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

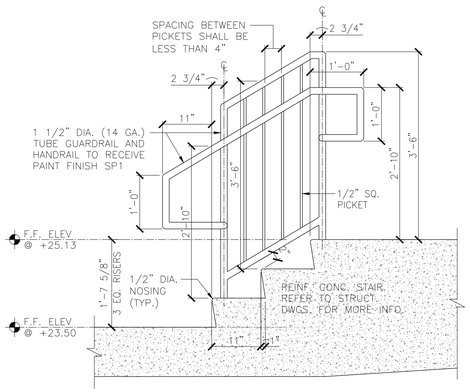
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

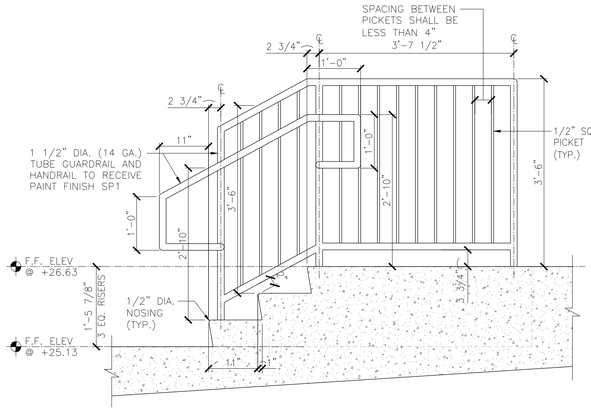
A-401



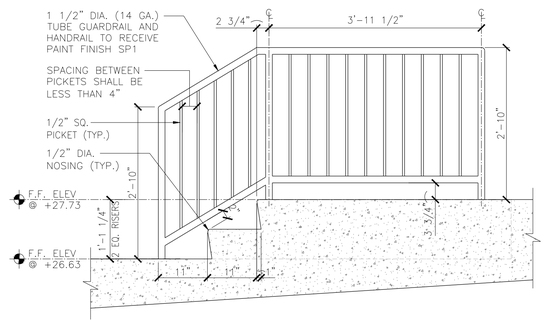
1 A-402 **RAMP SECTION**
SCALE: 1/8" = 1'-0"



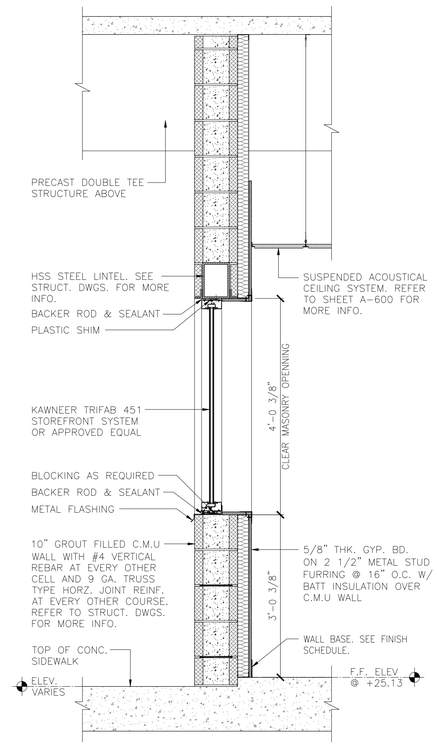
2 A-402 **STAIR SECTION**
SCALE: 1/8" = 1'-0"



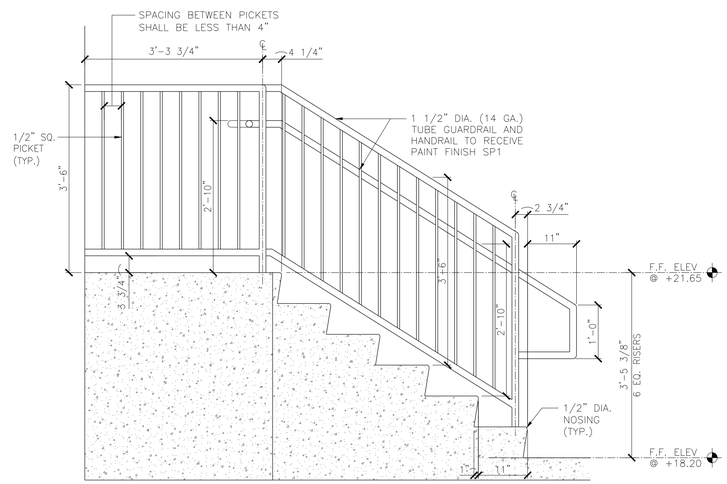
3 A-402 **STAIR SECTION**
SCALE: 1/8" = 1'-0"



4 A-402 **STAIR SECTION**
SCALE: 1/8" = 1'-0"



5 A-402 **WALL SECTION**
SCALE: 1/8" = 1'-0"



6 A-402 **STAIR ELEVATION AT COUNTY VEHICLE PARKING AREA**
SCALE: 1/8" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.0066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SHERIFF'S DEPARTMENT RAMP, STAIR & WALL SECTIONS AND STAIR ELEVATION AT COUNTY VEHICLE PARKING AREA

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

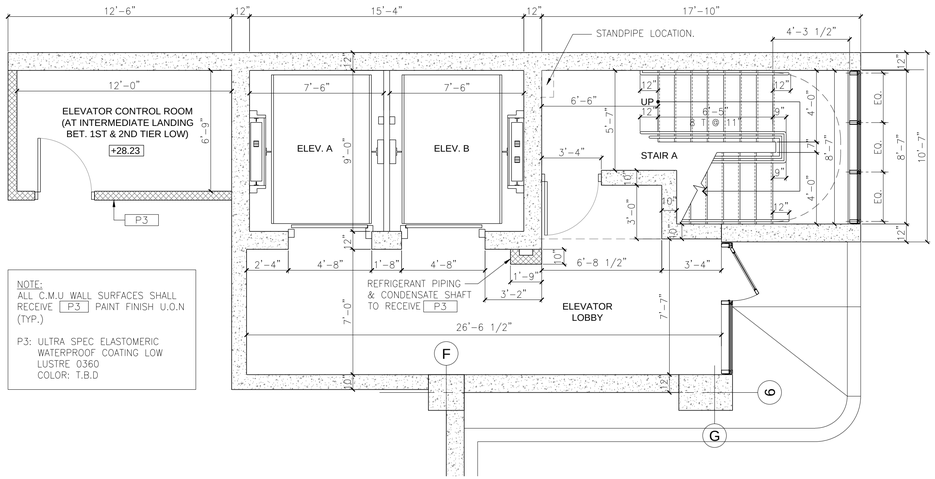
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

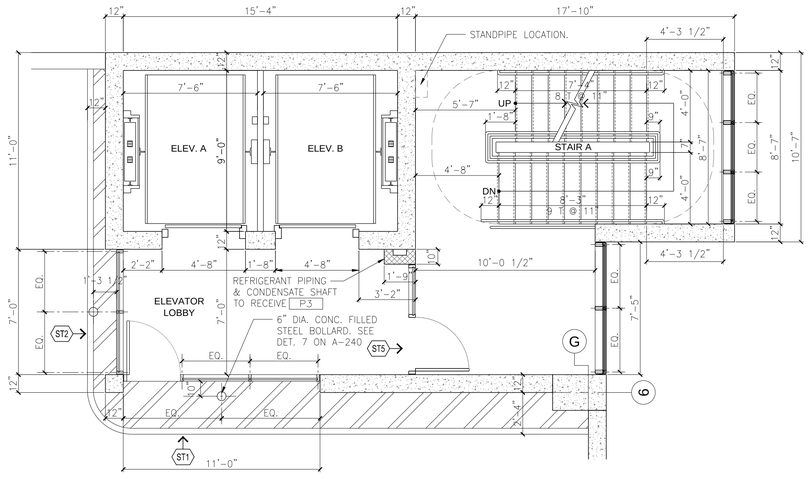
Drawing No.

A-402



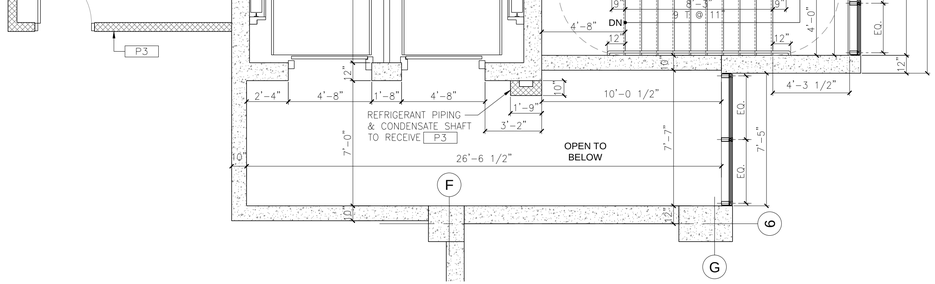
1 A-500 ENLARGED FIRST TIER ELEVATOR, LOBBY & STAIR - A PLAN

SCALE: 1/4"=1'-0"



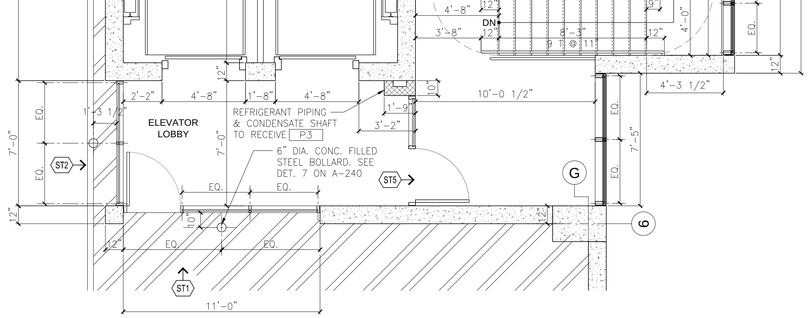
3 A-500 ENLARGED THIRD - SEVENTH TIER ELEVATOR, LOBBY & STAIR - A PLAN

SCALE: 1/4"=1'-0"



2 A-500 ENLARGED INTERMEDIATE ELEVATOR, AND STAIR -A PLAN BETWEEN FIRST AND THIRD TIER

SCALE: 1/4"=1'-0"



4 A-500 ENLARGED EIGHTH TIER ELEVATOR, LOBBY & STAIR - A PLAN

SCALE: 1/4"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLARGED PLAN: ELEVATORS A & B, LOBBY & STAIR - A

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

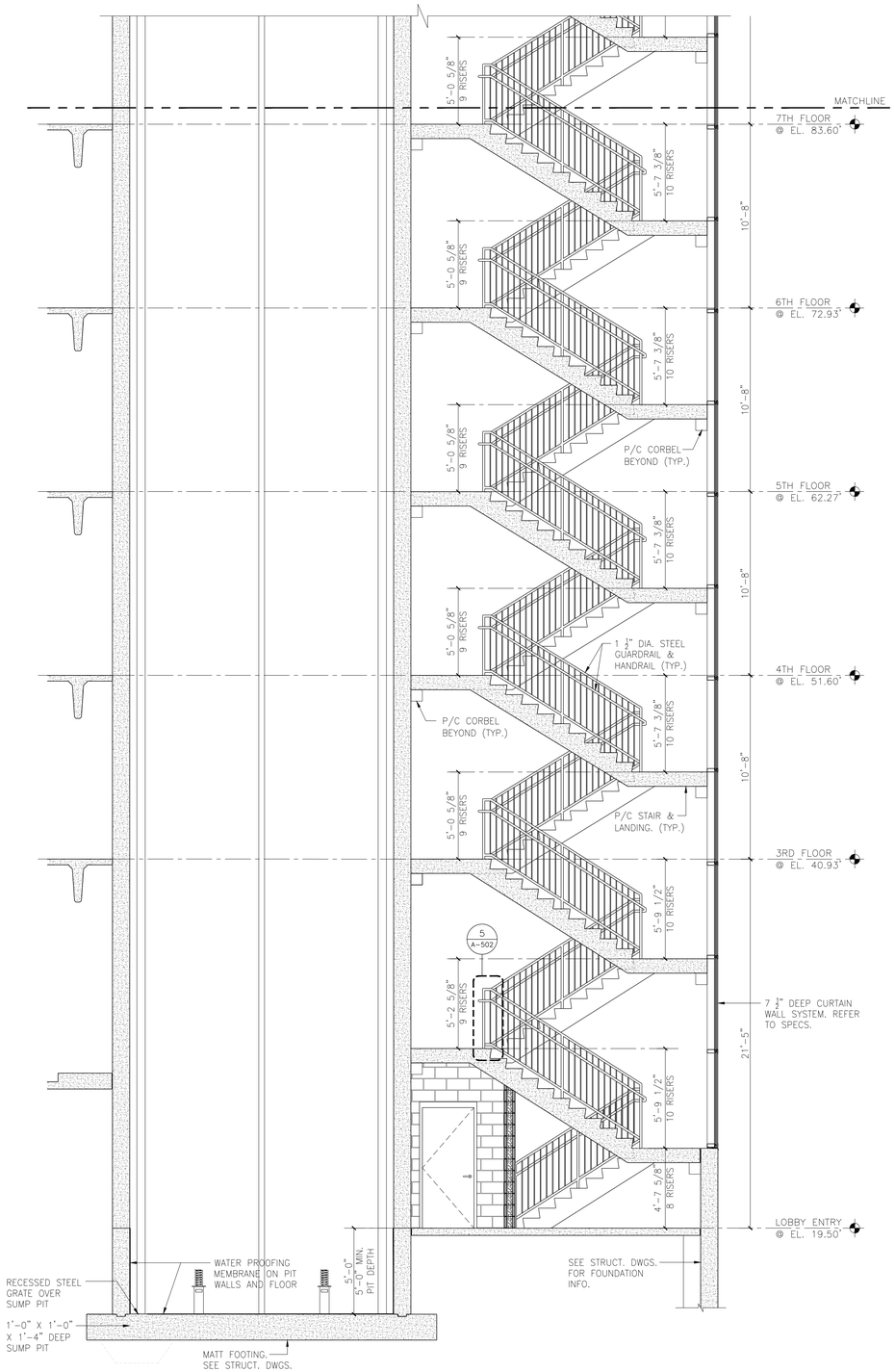
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

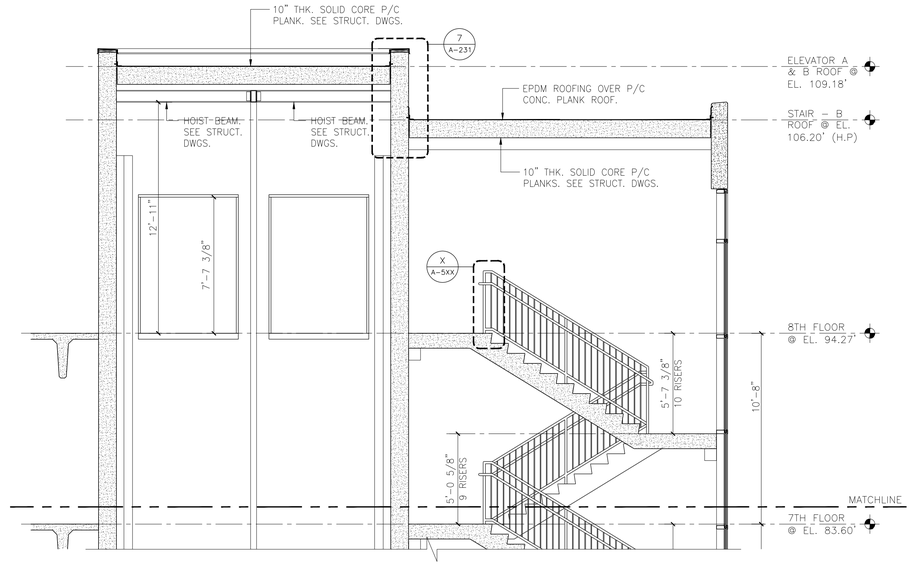
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-500



ELEVATORS - A & B AND STAIR - A SECTION
SCALE: 1/4" = 1'-0"



ELEVATOR A & B AND STAIR-A SECTION (CONTINUED)
SCALE: 1/4" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2006
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ELEVATORS - A & B AND STAIR - A SECTION

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

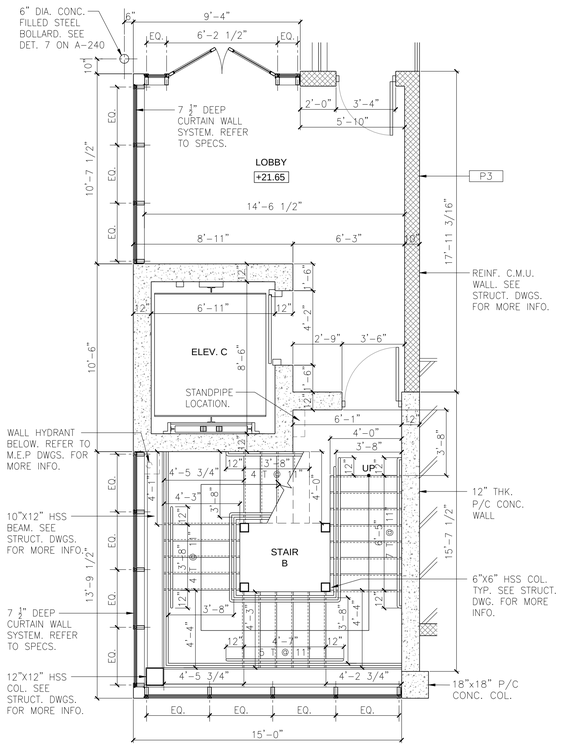
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

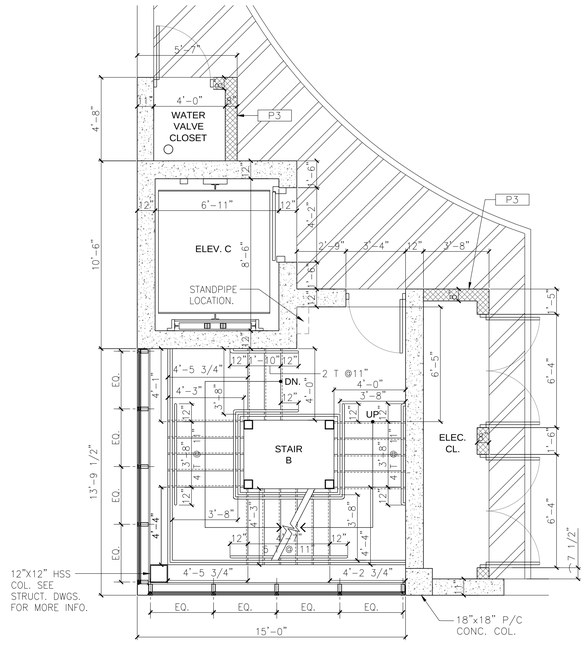
Drawing No.

A-501



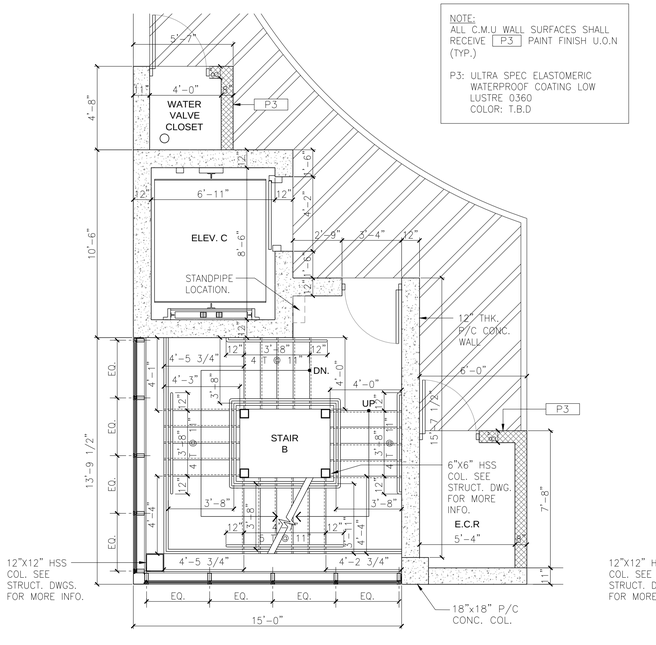
1 A-502 ENLARGED FIRST TIER ELEVATOR C, VESTIBULE & STAIR - B PLAN

SCALE: 1/4"=1'-0"



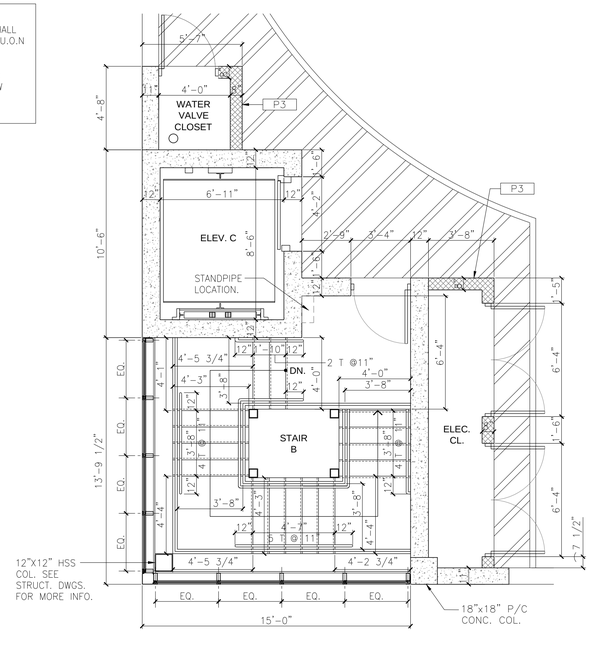
3 A-502 ENLARGED THIRD - SIXTH TIER WATER VALVE CL., ELEVATOR C, STAIR - B & ELEC. CL. PLAN

SCALE: 1/4"=1'-0"



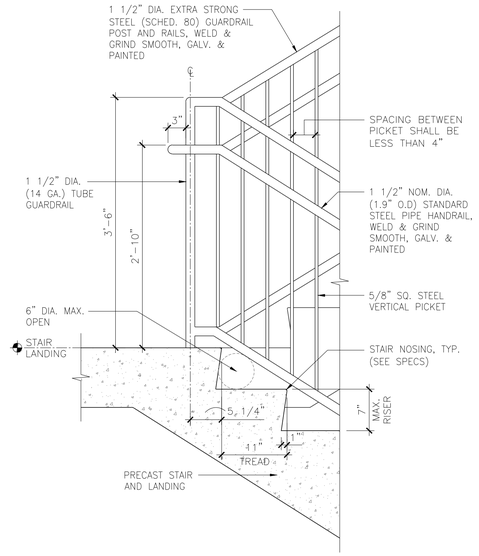
2 A-502 ENLARGED SECOND TIER WATER VALVE CL., ELEVATOR C, STAIR - B & E.C.R. PLAN

SCALE: 1/4"=1'-0"



4 A-502 ENLARGED SEVENTH TIER (HIGH), WATER VALVE CL., ELEVATOR C, STAIR - B & ELEC. CL. PLAN

SCALE: 1/4"=1'-0"

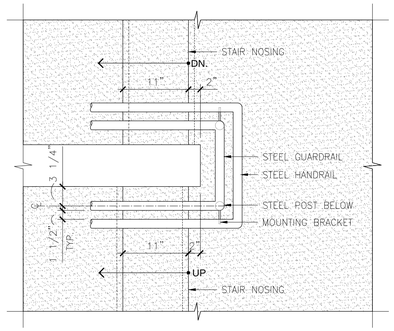


5 A-502 TYPICAL GUARDRAIL & HANDRAIL SECTION DETAIL

SCALE: 1" = 1'-0"

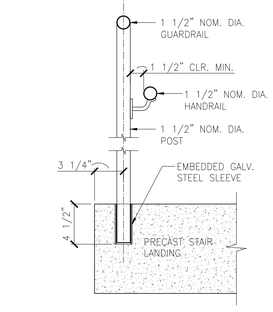
STAIRS, GUARDRAILS AND HANDRAIL GENERAL NOTES:

1. 7" MAXIMUM RISER HEIGHT.
2. 42" H. GUARDRAIL TYPICAL.
3. 36" H. HANDRAIL TYPICAL.
4. TYPICAL SPACING OF HORIZONTAL PICKETS IS LESS THAN 4" O.C. MAXIMUM.
5. TRIANGULAR OPENING BETWEEN BOTTOM OF GUARDRAIL, RISER AND
6. TREAD MUT BE LESS THAN 6" DIA.
7. RISER HEIGHTS SHOWN ARE PRELIMINARY. G.C. AND PRECASTER TO
8. COORDINATE CODE COMPLIANT STAIR RISER HEIGHTS FOR DRAINAGE
9. SLOPE AND WALKING SURFACE SLOPE REQUIRED.
10. RAILING CONTRACTOR TO PROVIDE POST LOCATIONS TO MEET GUARDRAIL
11. STRUCTURAL LOAD REQUIREMENTS. COORDINATE POST LOCATIONS WITH PRECASTER.
12. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.



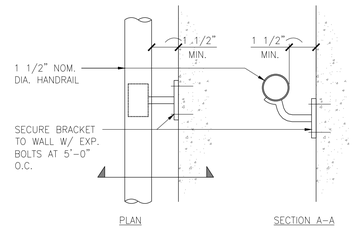
6 A-502 GUARDRAIL & HANDRAIL RETURN DETAIL AT STAIR-A

SCALE: 1"=1'-0"



7 A-502 GUARDRAIL & HANDRAIL MOUNTING DETAIL

SCALE: 1 1/2" = 1'-0"



8 A-502 HANDRAIL MOUNTING DETAIL

SCALE: 3" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2686
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ENLARGED PLAN: WATER VALVE CLOSET, ELEVATOR - C, STAIR - B & ELECTRIC CLOSET AND TYPICAL STAIR DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

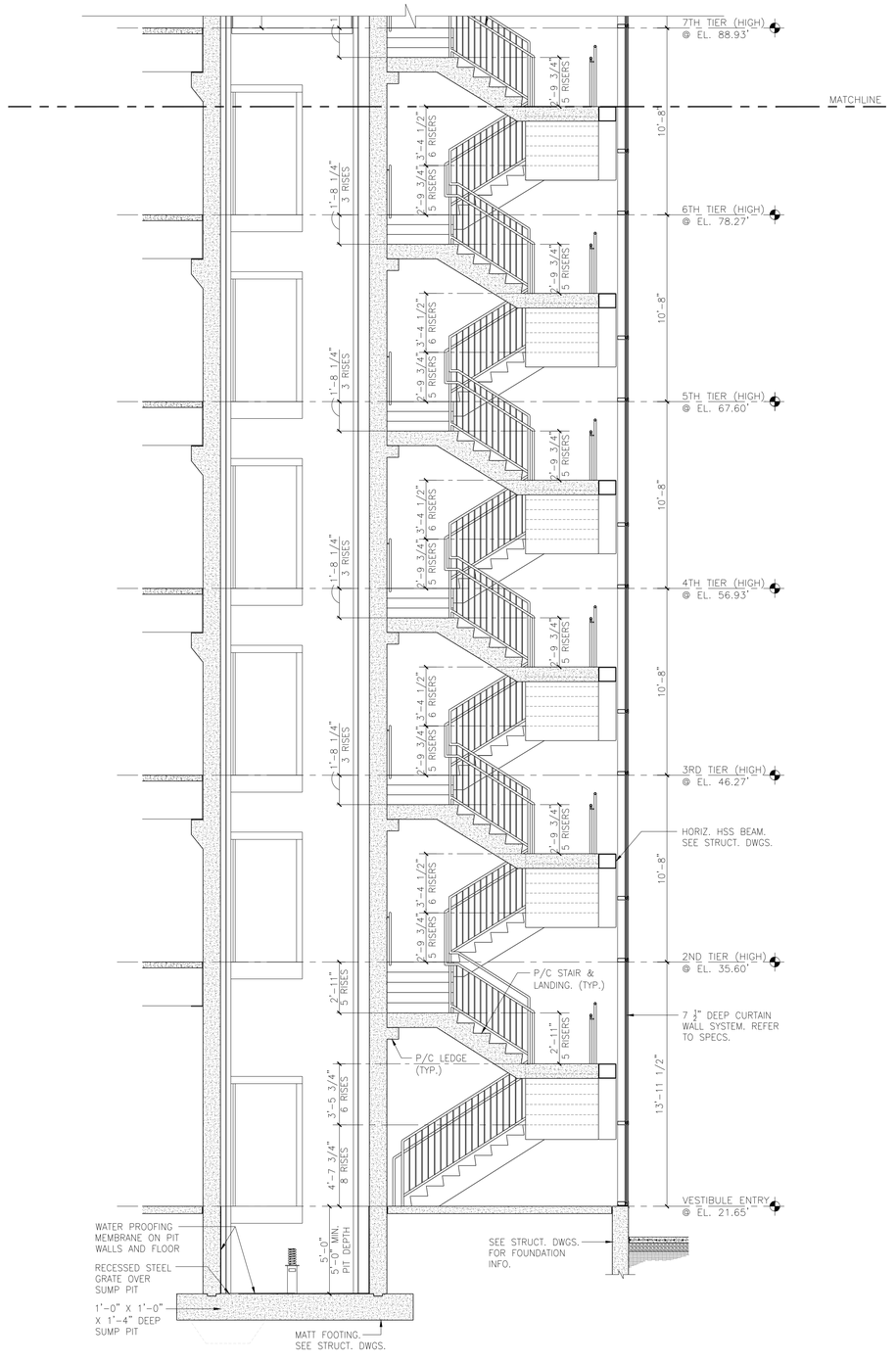
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

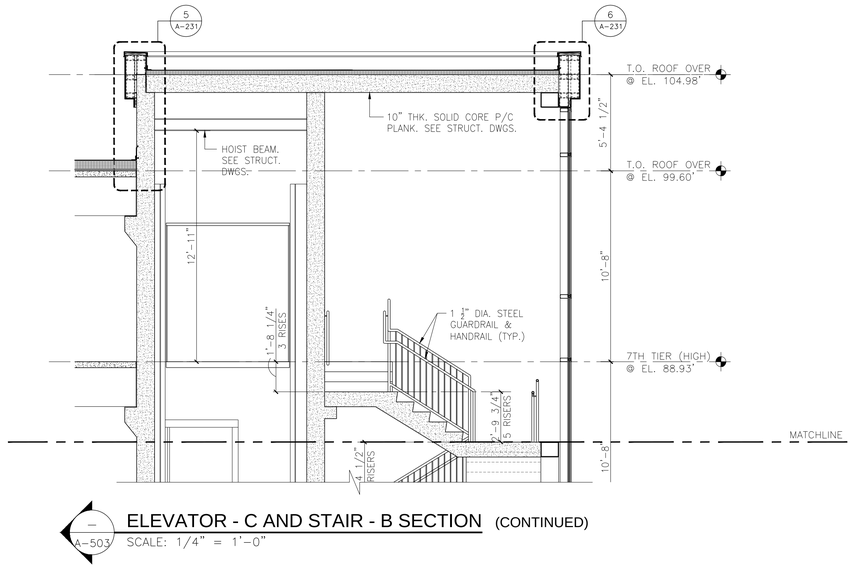
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-502



ELEVATOR - C AND STAIR - B SECTION
SCALE: 1/4" = 1'-0"



ELEVATOR - C AND STAIR - B SECTION (CONTINUED)
SCALE: 1/4" = 1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2006
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

ELEVATOR - C & STAIR - B SECTION

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

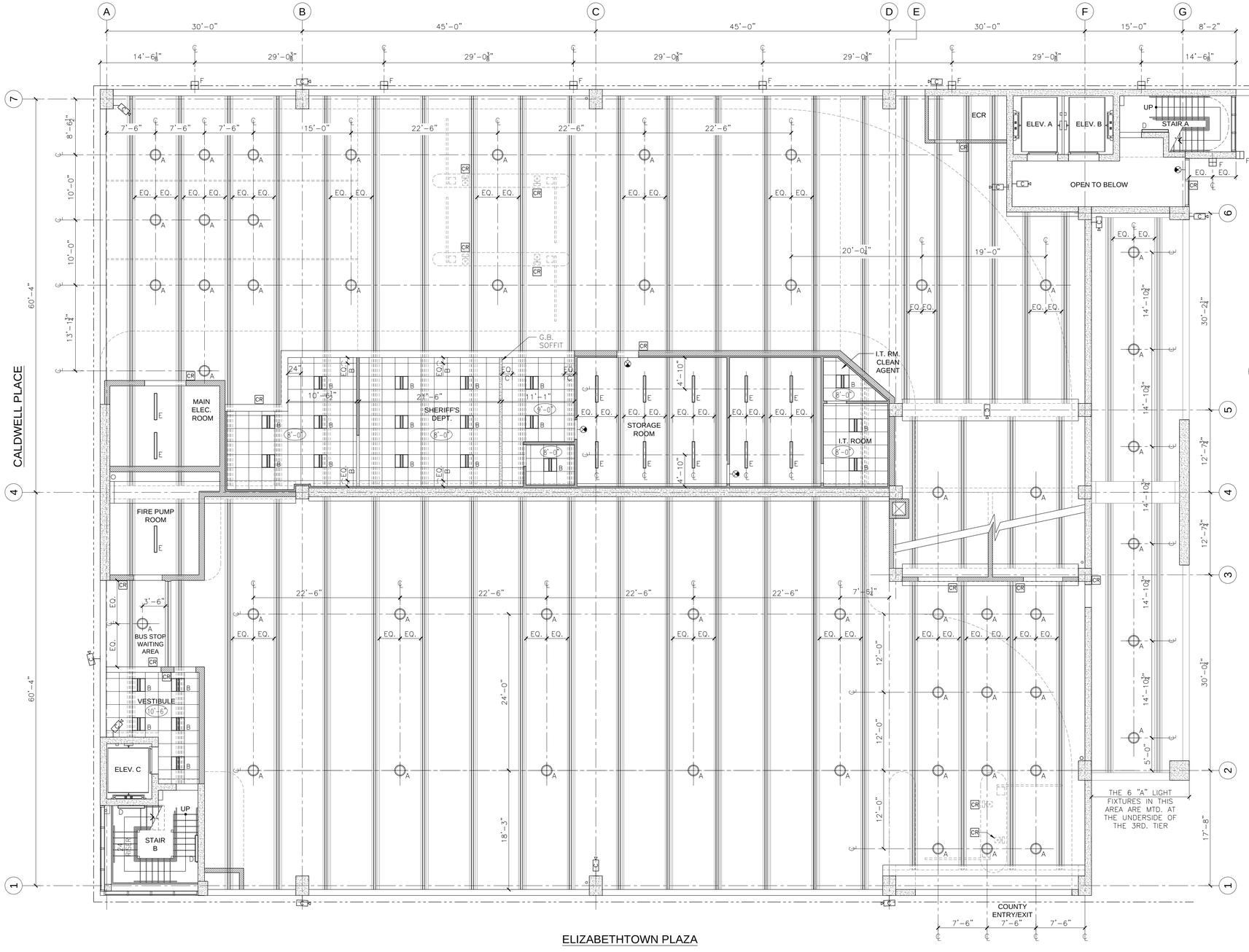
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-503



ELIZABETHTOWN PLAZA

A-600 FIRST TIER REFLECTED CEILING AND SECURITY PLAN
SCALE: 1/8"=1'-0"

REFLECTED CEILING PLAN LEGEND:

SUSPENDED CLEAN ROOM MYLAR CEILING TILE
TILE: ARMSTRONG CLEAN ROOM "MYLAR"
COLOR: WHITE, EDGE PROFILE: SQUARE LAY-IN EDGE
SIZE: 2' X 2' WITH CLEAN ROOM 15/16" TEE GRID

NOTE:
CEILING SYSTEM TO HAVE HOLD DOWN CLIPS

$ NEW LIGHT SWITCH BY LEVITON. DECORA SERIES
COMMERCIAL GRADE ROCKER SWITCH, COLOR WHITE, U.O.N.
MOUNTED AT 3'-2" A.F.F., U.O.N.

10'-0" CEILING HEIGHT TAG

A-201 DETAIL NUMBER / REFERENCE DRAWING NUMBER

LIGHT FIXTURE LEGEND:

A 19" DIA. SURFACE MOUNTED LED PARKING GARAGE LIGHT FIXTURE.
MFR: BEACON PRODUCTS
CATALOG: SRT2-85-4K8-SQW-UNV-LCS-LD6-UD-NXWE

B 2X2 RECESSED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: LCAT22-40VLG-ED1-U-NXWE

C PENDANT MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
EPLB-12-E-xx-PPA-yyy-42L-40K8-DCC-zzz-J9

D WALL/CEILING MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
MLHA8-48-F-MW-PP-1-67L40K-DCC-1-DV-CDF-MS-9500

E PENDANT MOUNTED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: MPS4-40ML-CP-W-E-U-NXWE

F WALL MOUNTED LIGHT FIXTURE
MFR: KENALL - MODEL: FN15
CATALOG: FN15L-3-7-DB-49L40K8-DCC-DV-2C-SA-9500-LP

CEILING MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL - MILLENIUM METREX
CATALOG: METSW-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

H WALL MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL - MILLENIUM METREX
CATALOG: METS/DU-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

WALL MOUNTED EMERGENCY LIGHT FIXTURE WITH BACK-UP BATTERY
MFR: KENALL - METEL SERIES
CATALOG: METEL-24N-MW-6-5L-DT-CEL-9500-LP

SECURITY LEGEND:

CEILING MOUNTED SECURITY CAMERA

WALL MOUNTED SECURITY CAMERA

CR CARD READER

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIRST TIER REFLECTED CEILING AND SECURITY PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

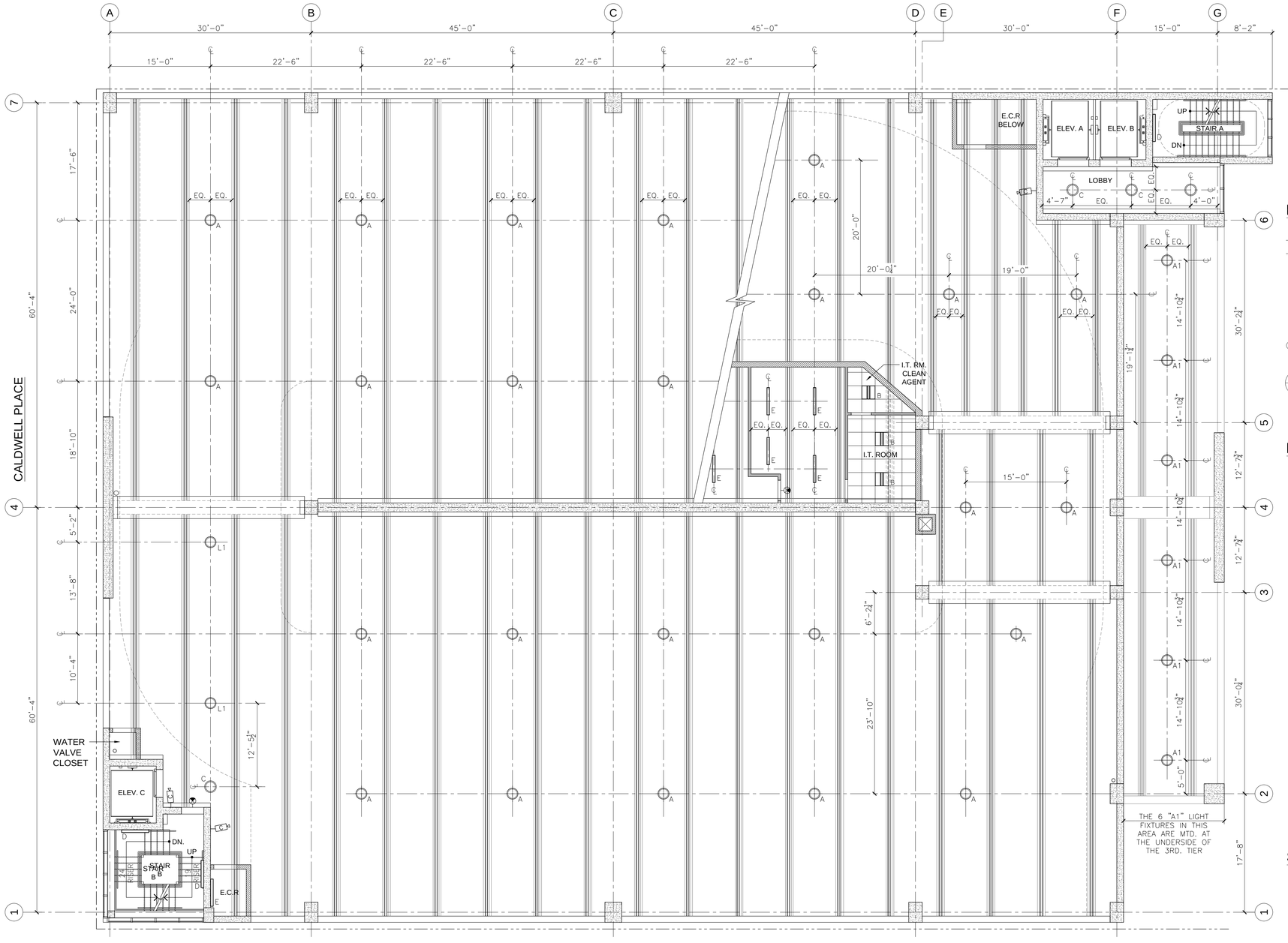
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-600



ELIZABETHTOWN PLAZA

SECOND TIER REFLECTED CEILING AND SECURITY PLAN
A-601 SCALE: 1/8"=1'-0"

REFLECTED CEILING PLAN LEGEND:

SUSPENDED CLEAN ROOM MYLAR CEILING TILE
TILE: ARMSTRONG CLEAN ROOM "MYLAR"
COLOR: WHITE, EDGE PROFILE: SQUARE LAY-IN EDGE
SIZE: 2' X 2' WITH CLEAN ROOM 15/16" TEE GRID

NOTE:
CEILING SYSTEM TO HAVE HOLD DOWN CLIPS

$ NEW LIGHT SWITCH BY LEVITON. DECORA SERIES
COMMERCIAL GRADE ROCKER SWITCH, COLOR WHITE, U.O.N.
MOUNTED AT 3'-2" A.F.F., U.O.N.

10'-0" CEILING HEIGHT TAG

A-302 DETAIL NUMBER / REFERENCE DRAWING NUMBER

LIGHT FIXTURE LEGEND:

A 19" DIA. SURFACE MOUNTED LED PARKING GARAGE LIGHT FIXTURE.
MFR: BEACON PRODUCTS
CATALOG: SRT2-85-4K8-SQW-UNV-LGS-LD6-UD-NXWE

B 2X2 RECESSED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: LCAT22-40VLG-ED1-U-NXWE

C PENDANT MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
EPLB-12-E-xx-PPA-yyy-42L-40K8-DCC-zzz-J9

D WALL/CEILING MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
MLHA8-48-F-MW-PP-1-67L40K-DCC-1-DV-CDF-MS-9500

E PENDANT MOUNTED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: MPS4-40ML-CP-W-E-U-NXWE

F WALL MOUNTED LIGHT FIXTURE
MFR: KENALL - MODEL: FN15
CATALOG: FN15L-3-7-DB-49L40K8-DCC-DV-2C-SA-9500-LP

CEILING MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL - MILLENIUM METREX
CATALOG: METSW-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

WALL MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL - MILLENIUM METREX
CATALOG: METS/DU-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

WALL MOUNTED EMERGENCY LIGHT FIXTURE WITH BACK-UP BATTERY
MFR: KENALL - METEL SERIES
CATALOG: METEL-24N-MW-6-5L-DT-CEL-9500-LP

SECURITY LEGEND:

CEILING MOUNTED SECURITY CAMERA

WALL MOUNTED SECURITY CAMERA

CR CARD READER

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2606
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECOND TIER REFLECTED CEILING AND SECURITY PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

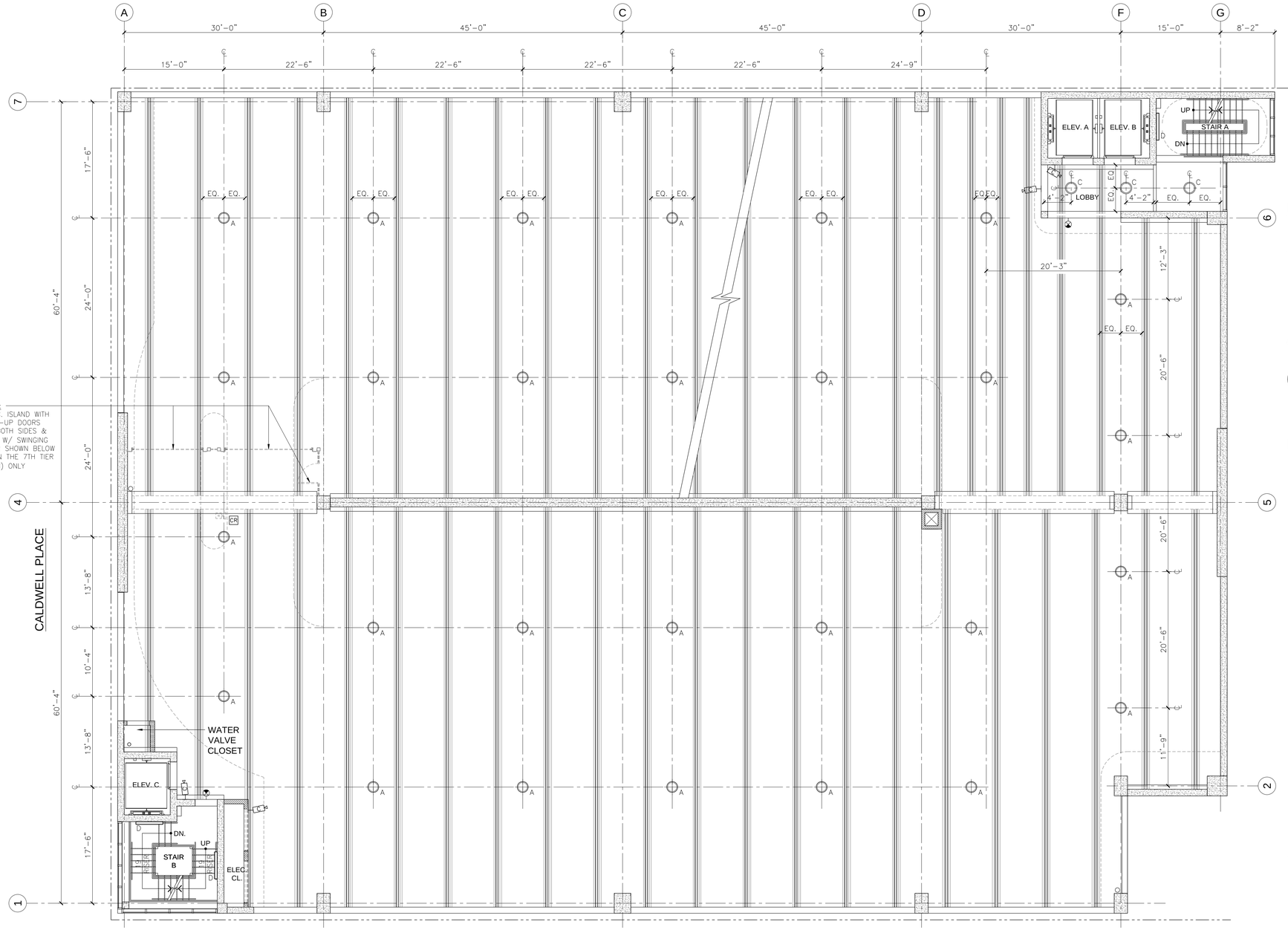
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-601



ELIZABETHTOWN PLAZA

THIRD - EIGHTH TIER REFLECTED CEILING AND SECURITY PLAN
A-602 SCALE: 1/8"=1'-0"

REFLECTED CEILING PLAN LEGEND:

SUSPENDED CLEAN ROOM MYLAR CEILING TILE
TILE: ARMSTRONG CLEAN ROOM "MYLAR"
COLOR: WHITE, EDGE PROFILE: SQUARE LAY-IN EDGE
SIZE: 2' X 2' WITH CLEAN ROOM 15/16" TEE GRID

NOTE:
CEILING SYSTEM TO HAVE HOLD DOWN CLIPS

$ NEW LIGHT SWITCH BY LEVITON. DECORA SERIES
COMMERCIAL GRADE ROCKER SWITCH, COLOR WHITE, U.O.N.
MOUNTED AT 3'-2" A.F.F., U.O.N.

10'-0" CEILING HEIGHT TAG

A-302 DETAIL NUMBER
REFERENCE DRAWING NUMBER

LIGHT FIXTURE LEGEND:

A 19" DIA. SURFACE MOUNTED LED PARKING GARAGE LIGHT FIXTURE.
MFR: BEACON PRODUCTS
CATALOG: SRT2-85-4K8-SQW-UNV-LCS-LD6-UD-NXWE

B 2X2 RECESSED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: LCAT22-40VLG-ED1-U-NXWE

C PENDANT MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
EPLB-12-E-xx-PPA-yyy-42L-40K8-DCC-zzz-J9

D WALL/CEILING MOUNTED LED LIGHT FIXTURE
MFR: KENALL MFG.
CATALOG:
MLHA8-48-F-MW-PP-1-67L40K-DCC-1-DV-CDF-MS-9500

E PENDANT MOUNTED LED LIGHT FIXTURE
MFR: COLUMBIA LIGHTING
CATALOG: MPS4-40ML-CP-W-E-U-NXWE

F WALL MOUNTED LIGHT FIXTURE
MFR: KENALL – MODEL: FN15
CATALOG: FN15L-3-7-DB-49L40K8-DCC-DV-2C-SA-9500-LP

CEILING MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL – MILLENIUM METREX
CATALOG: METSW-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

WALL MOUNTED EXIT LIGHT FIXTURE
MFR: KENALL – MILLENIUM METREX
CATALOG: METS/DU-MW-R-DT-CEL-9500-LP
NOTE: REFER TO RCP FOR LOCATIONS AND DIRECTION OF ARROWS

WALL MOUNTED EMERGENCY LIGHT FIXTURE WITH BACK-UP BATTERY
MFR: KENALL – METEL SERIES
CATALOG: METEL-24N-MW-6-5L-DT-CEL-9500-LP

SECURITY LEGEND:

CEILING MOUNTED SECURITY CAMERA

WALL MOUNTED SECURITY CAMERA

CR CARD READER

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2666
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

THIRD - EIGHTH TIER REFLECTED CEILING AND SECURITY PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

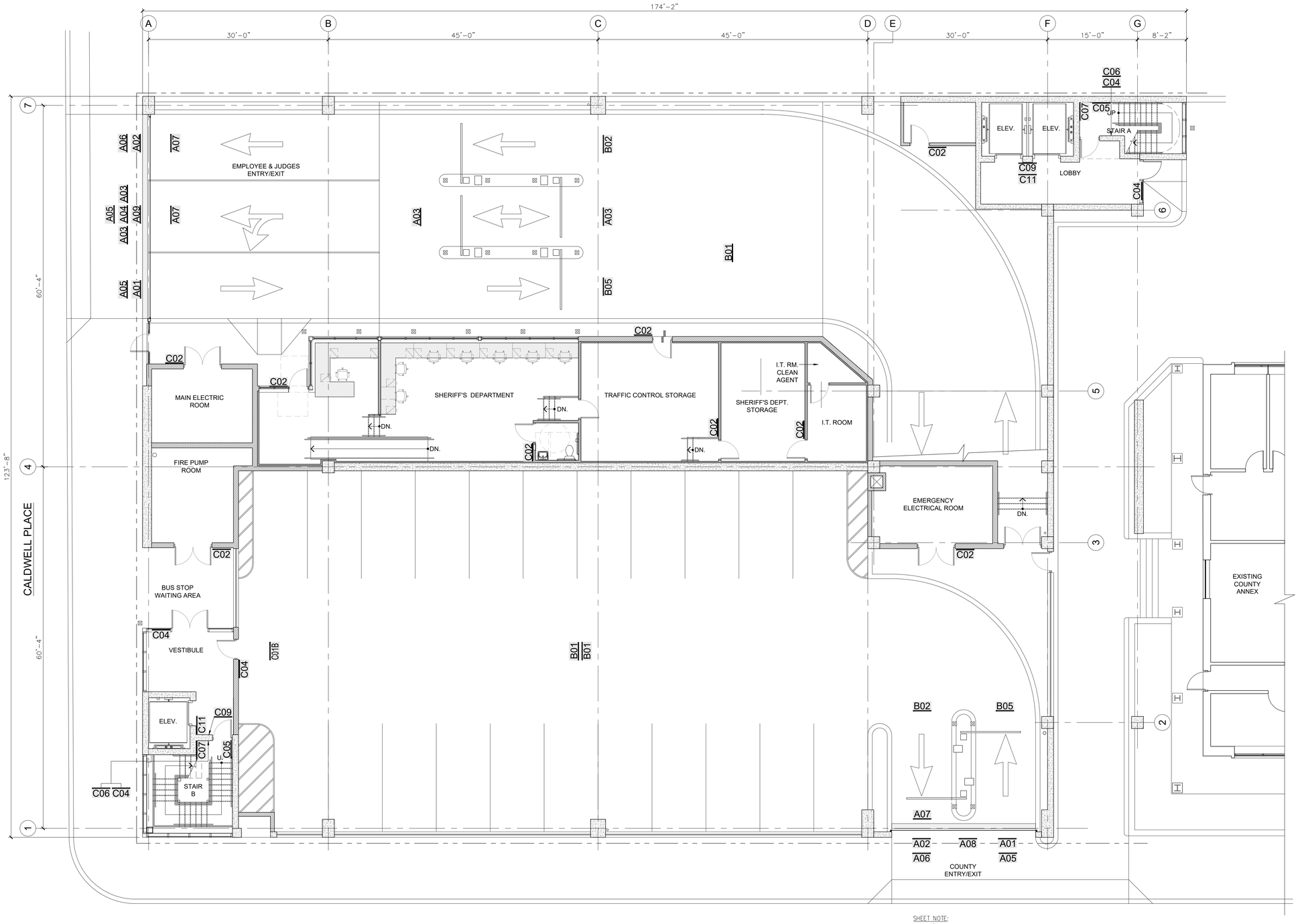
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-602



1 A-700 FIRST TIER SIGNAGE PLAN

SCALE: 1/8"=1'-0"

ELIZABETHTOWN PLAZA

SHEET NOTE:
ENTRY/EXIT ELEVATIONS TO COORDINATE ALL SIGN LOCATIONS AND MOUNTING HEIGHTS.

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone 212.777.0066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIRST TIER SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

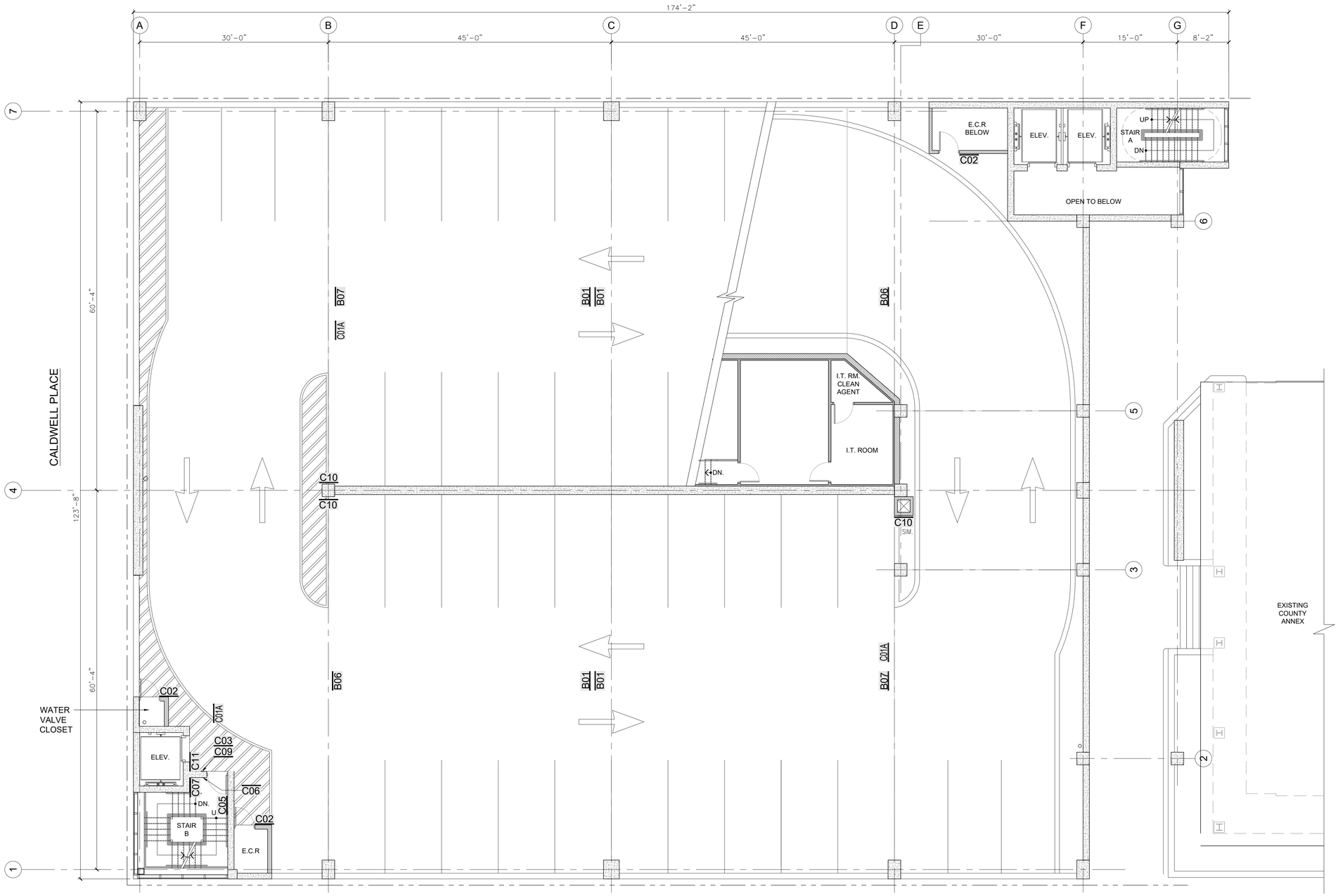
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-700



ELIZABETHTOWN PLAZA

1 A-702 SECOND TIER SIGNAGE PLAN
SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SECOND TIER SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

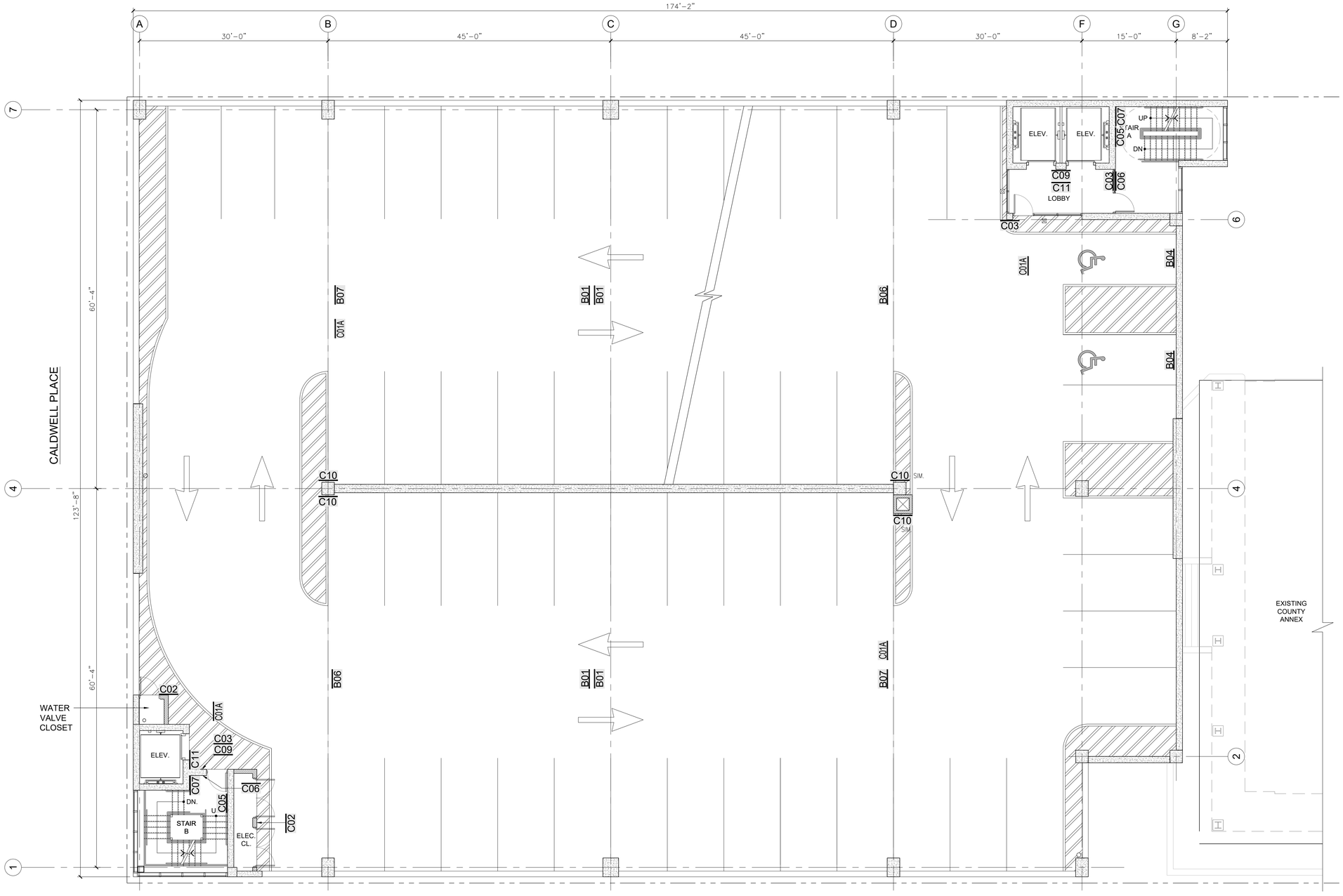
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-702



ELIZABETHTOWN PLAZA

1 / A-703 THIRD TIER SIGNAGE PLAN
SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

THIRD TIER
SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

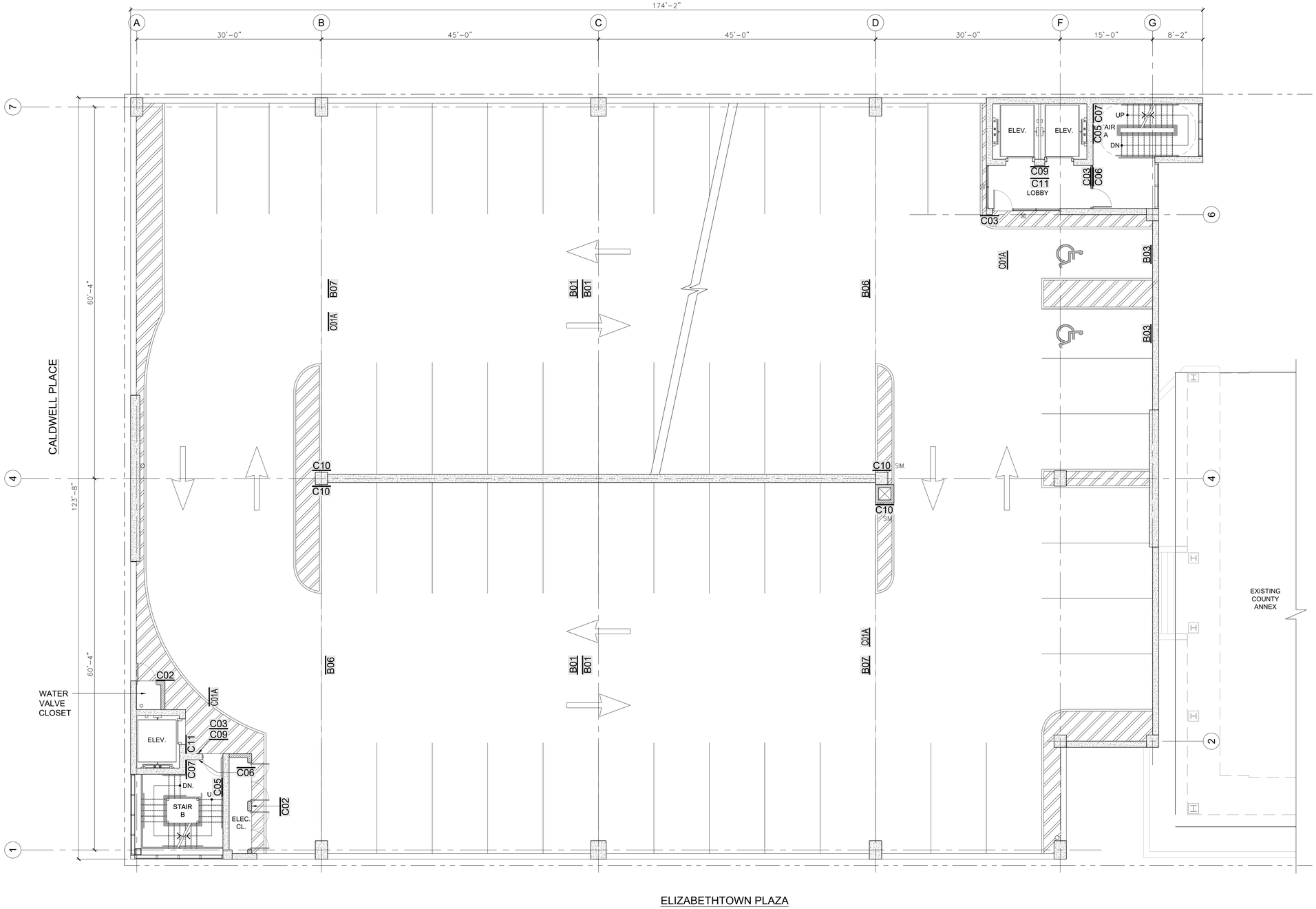
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-703



ELIZABETHTOWN PLAZA

1 A-704 FOURTH TIER SIGNAGE PLAN
SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FOURTH TIER SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

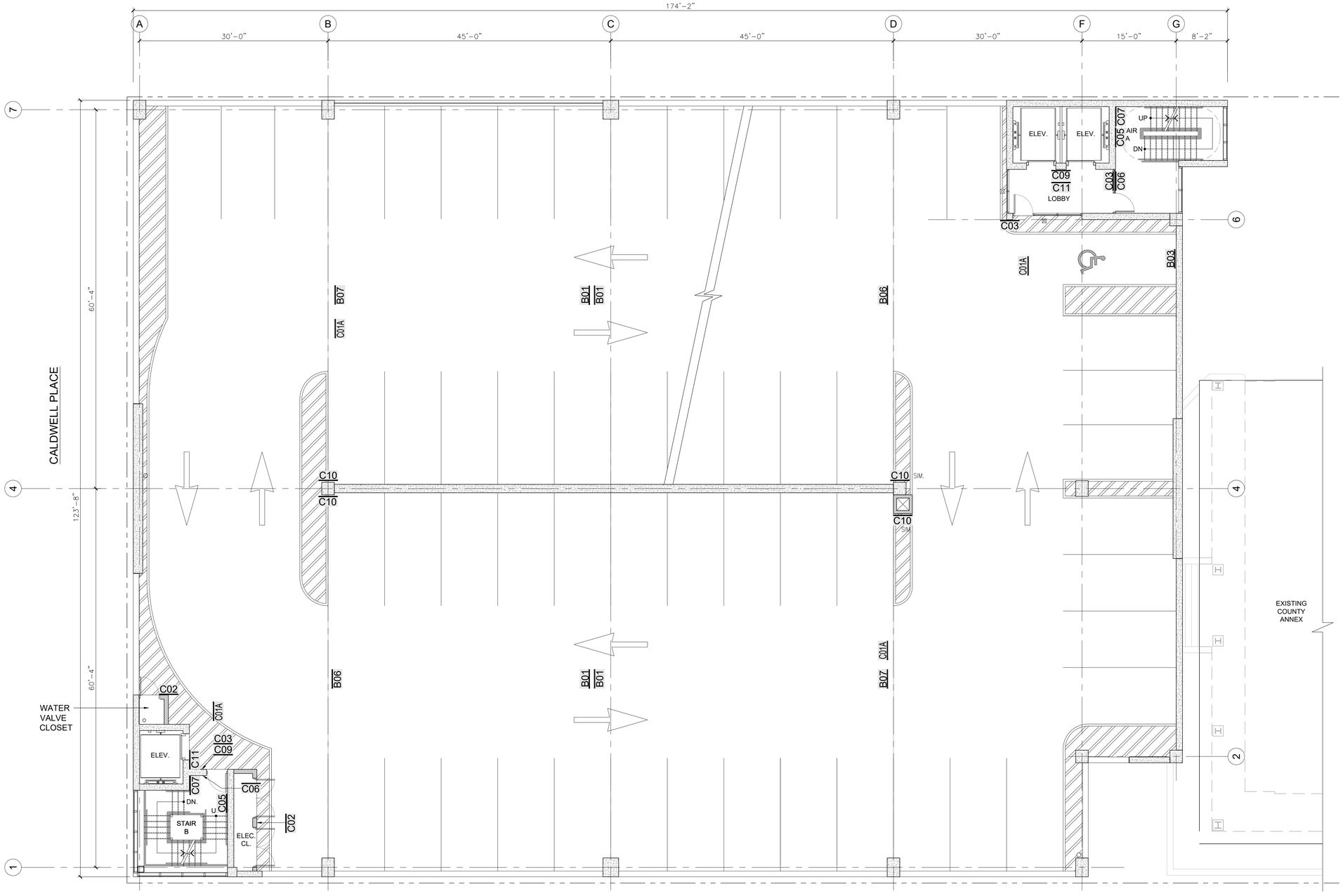
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-704



ELIZABETHTOWN PLAZA

1 A-705 FIFTH - SEVENTH TIER SIGNAGE PLAN

SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

FIFTH - SEVENTH TIER SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

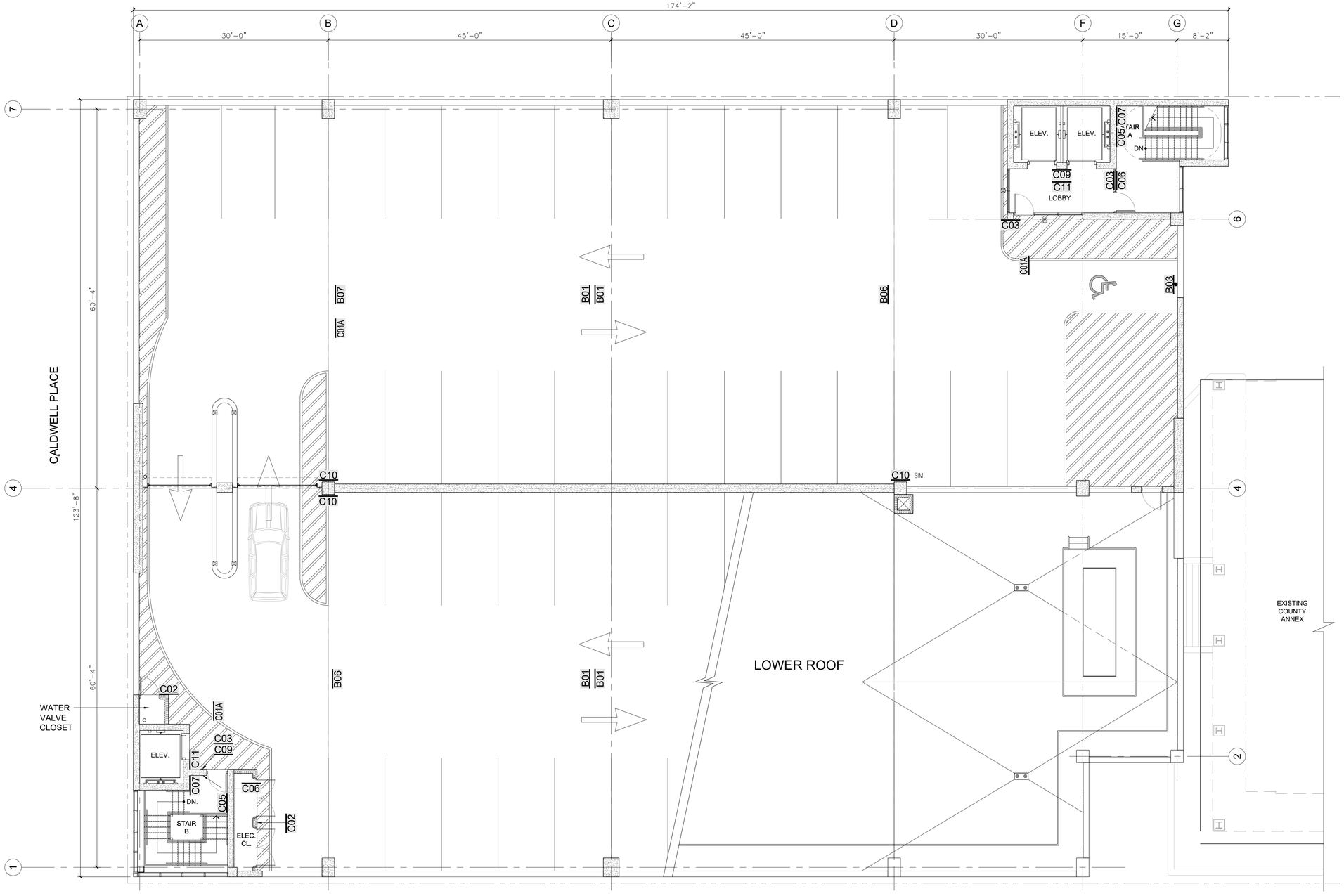
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-705



ELIZABETHTOWN PLAZA

1 A-706 EIGHTH TIER SIGNAGE PLAN
SCALE: 1/8"=1'-0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2066
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0066
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

EIGHTH TIER
SIGNAGE PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

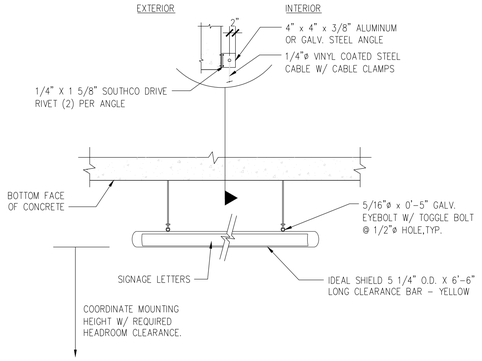
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

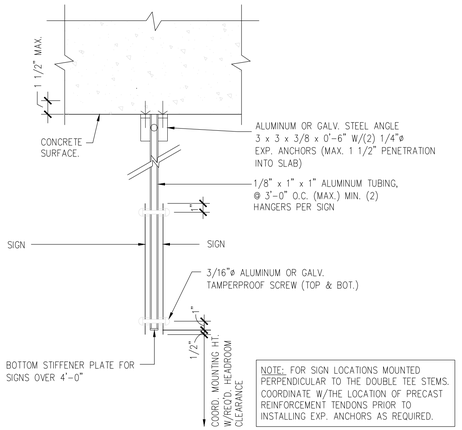
Drawing No.

A-706



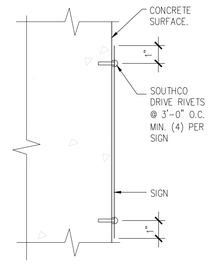
1 A-707 MOUNTING DETAIL

SCALE: 1/2" 1'-0"



2 A-707 MOUNTING DETAIL

SCALE : 1-1/2" = 1' - 0"



3 A-707 MOUNTING DETAIL

SCALE : 3" - 1' - 0"

4 A-707 MOUNTING DETAIL

SCALE : 3/4" = 1' - 0"

5 A-707 MOUNTING DETAIL

SCALE : 3/4" = 1' - 0"

SIGNAGE SCHEDULE

A. PARK SIGNS

SIGN	SIZE W	SIZE H	SIGN TYPE	MTG. DTL.	DETAIL
A01	7'-0"	0'-10"	↓ ENTER ↓	ELECTRICAL SIGN, COORDINATE W/ MEP & MANUFACTURER'S SPECS. FOR MOUNTING DETAILS	1/A-708
A02	7'-0"	0'-10"	⊖ EXIT ⊖		1/A-708
A03	1'-6"	1'-6"	↓ OR ✕		1/A-708
A04	2'-2"	0'-10"	ENTER OR EXIT		1/A-708
A05	6'-6"	0'-5 1/4"	8'-2" CLEARANCE 8'-2"	1/A-707	1/A-708
A06	6'-6"	0'-5 1/4"	⊖ DO NOT ENTER ⊖	1/A-707	1/A-708
A07	5'-0"	0'-10"	CAUTION: LOOK FOR PEDESTRIANS ON SIDEWALK	2 OR 4/A-707	1/A-708
A08	5'-0"	0'-10"	UNION COUNTY EMPLOYEE PARKING	3/A-707	1/A-708
A09	6'-0"	0'-10"	EMPLOYEE PARKING	3/A-707	1/A-708

B. VEHICULAR WAY FINDING SIGNS

SIGN	SIZE W	SIZE H	SIGN TYPE	MTG. DTL.	DETAIL
B01	6'-8"	0'-10"	5 SPEED LIMIT 5	2/A-707	1/A-708
B02	3'-6"	0'-10"	↓ EXIT ↓	2 OR 4/A-707	1/A-708
B03	1'-0"	2'-8"	RESERVED PARKING (A.D.A)	3 OR 5/A-707	1/A-708
B04	1'-0"	3'-2"	RESERVED PARKING (A.D.A VAN)	3/A-707	1/A-708
B05	5'-4"	0'-10"	⊖ DO NOT ENTER ⊖	2 OR 4/A-707	1/A-708
B06	3'-6"	0'-10"	PARK →	4/A-707	1/A-708
B07	3'-6"	0'-10"	← OUT	4/A-707	1/A-708

C. PEDESTRIAN WAY FINDING SIGNS

SIGN	SIZE W	SIZE H	SIGN TYPE	MTG. DTL.	DETAIL
C01A	5'-4"	0'-10"	← STAIR / ELEVATOR	4/A-707	1/A-709
C01B	5'-4"	0'-10"	↑ STAIR/ELEVATOR	4/A-707	1/A-709
C02	0'-8"	0'-4"	ROOM IDENTIFICATION (GARAGE AND STORAGE)	3/A-707	1/A-709
C03	0'-6"	0'-10"	EXIT STAIR	3/A-707	1/A-709
C04	0'-6"	0'-10"	EXIT	3/A-707	1/A-709
C05	1'-2"	1'-6"	STAIRWAY ID SIGN	3/A-707	1/A-709
C06	0'-8"	0'-4"	STAIR-LEVEL ID SIGN	3/A-707	1/A-709
C07	0'-10"	0'-8"	FDC -DRY STANDPIPE	3/A-707	1/A-709
C08	1'-2"	0'-9"	FIRE EXTINGUISHERS	3/A-707	1/A-709
C09	2'-0"	2'-0"	LEVEL SIGN @ STAIR/ELEVATOR LOBBY	SEE DET. 2/A-709 FOR INFO.	1/A-709
C10	2'-2"	3'-0"	LEVEL ID (AT COLUMN)	SEE DET. 3/A-709 FOR INFO	1/A-709
C11	0'-8"	1'-0"	FIRE EMERGENCY SIGN (ELEVATOR)	3/A-707	1/A-709

SIGNAGE GENERAL NOTES:

A. SCHEDULE NOTES:
1. SEE SHEETS A-700 THROUGH A-706 FOR SIGN LOCATION PLANS
2. ALL SURFACE MOUNTED SIGNS SHALL NOT EXTEND BEYOND EDGE OF PRECAST WALLS AND COLUMNS.
3. CONFIRM ALL SIGN LOCATIONS WITH ARCHITECT BEFORE INSTALLATION.

B. TYPICAL PEDESTRIAN SIGNS (ROOM ID, STAIR ID, EXIT EGRESS IDENTIFICATION SIGNS):
1. TYPEFONT: ARIAL
2. SIGN SHALL BE BACKGROUND COLOR-REVERSE PAINTED IN COLORS INDICATED.
3. SIGN TO BE ADA COMPLIANT WITH ICC/ANSI A117.1, INCLUDING TACTILE TEXT AND BRAILLE REQUIREMENTS.
4. CENTER ALL SYMBOLS AND TEXT ON SIGN HORIZONTALLY AND VERTICALLY, U.N.O.
5. MATERIAL: 1/4" THICKNESS, U.N.O. CLEAR NON-GLARE, EXTERIOR GRADE PHOTOPOLYMER.
6. SYMBOLS AND PICTOGRAMS: SHALL HAVE A NON-GLARE FINISH AND COMPLY WITH ICC/ANSI A117.1.
7. SIGNS MOUNTED TO GLASS SURFACES TO BE ADHERED WITH EXTERIOR GRADE V.H.B. TAPE.
8. LAMINATE SIGN TO A ALUMINUM BACKING WHEN POST MOUNTED. SEE NOTE C.4.

C. TYPICAL DIRECTIONAL / TRAFFIC SIGNS
1. TYPEFONT: ARIAL NARROW BOLD, U.N.O. SEE SIGN DETAILS AND SCHEDULE FOR TEXT HEIGHTS.
2. BACKGROUND AS NOTED IN DETAILS SHALL BE SILK SCREENED OVER REFLECTIVE BACKGROUND (3M ENGINEER GRADE "SCOTCHLITE" #3290 REFLECTIVE SHEETING, OR APPROVED EQUAL) U.N.O.
3. REFLECTIVE SYMBOLS AND TEXT SHALL BE REVERSED STENCILED RESULTING FROM BACKGROUND COLOR APPLICATION OVER REFLECTIVE SHEETING.
4. BACKING MATERIALS FOR SIGNS SHALL BE 0.080 THICK ALUMINUM, U.N.O. PAINT EDGES AND BACKS OF ALUMINUM SIGNS THAT ARE DIRECTLY TO THE STRUCTURE FOR CATHODIC AND CORROSION PROTECTION.
5. MOUNT ALL SIGNS PLUMB AND LEVEL. OVERHEAD CLEARANCE HEIGHT SHALL NOT ENCROACH INTO THE VERTICAL CLEARANCE REQUIREMENTS OF THE PARKING FACILITY.
6. SIGNAGE CONTRACTOR TO VERIFY LOCATIONS OF SIGNAGE IN THE FIELD WITH THE ARCHITECT PRIOR TO INSTALLATION.
7. WHERE SIGNS ARE MOUNTED BACK-TO-BACK, INCREASE THE WIDTH OF THE SMALLER SIGN TO MATCH THE LARGER.

D. ILLUMINATED SIGNS
1. POWER INFORMATION TO SIGN LOCATIONS TO BE PROVIDED BY ELECTRICAL ENGINEER. SEE ELECTRICAL DRAWNGS. SIGNAGE CONTRACTOR TO COORDINATE THE ELECTRICAL COMPONENTS OF SIGNS WITH THE PROVIDED POWER SUPPLY.
2. ALL ELECTRICAL SUPPLY COMPONENTS INCLUDING BUT NOT LIMITED TO JUNCTION BOXES, TRANSFORMERS AND CONDUIT ARE TO BE CONCEALED AND NOT VISIBLE FROM THE BUILDING EXTERIOR.

E. LEVEL COLOR DESIGNATION:

LEVEL 8 PANTONE BLACK C, WHITE LETTERING
LEVEL 7 PANTONE BROWN 469C, WHITE LETTERING
LEVEL 6 PANTONE PROCESS BLUE C, WHITE LETTERING
LEVEL 5 PANTONE ORANGE 021C, WHITE LETTERING
LEVEL 4 PANTONE VIOLET C, WHITE LETTERING
LEVEL 3 PANTONE GREEN C, WHITE LETTERING
LEVEL 2 PANTONE RED 186C, WHITE LETTERING
LEVEL G PANTONE DARK GRAY C, WHITE LETTERING

(ALL COLORS SELECTED FROM THE PANTONE SOLID COATED COLOR LIBRARY)

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.277.2626
www.nettaarchitects.com
CERTIFICATE OF AUTHORIZATION AC-438
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SIGNAGE SCHEDULE, DETAILS AND GENERAL NOTES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

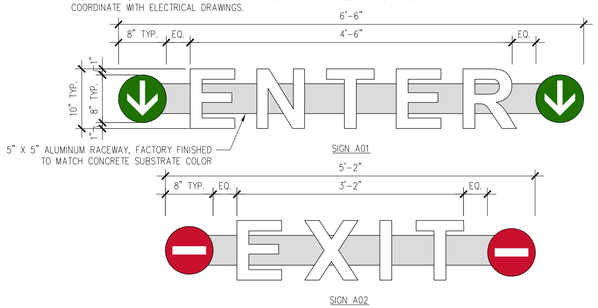
Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-707

INTERNALLY ILLUMINATED CHANNEL LETTER SIGN NOTES:

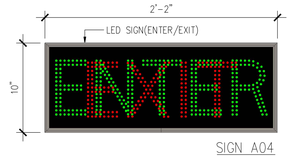
1. FACE COLORED ACRYLIC
   A. TEXT: TRANSLUCENT WHITE
   B. DO NOT ENTER SYMBOL: PANTONE RED 186 C
   C. ARROW SYMBOL: PANTONE GREEN 356 C
2. TRIM CAP COLOR: BLACK
3. 5" RETURN COLOR: BLACK
4. TEXT:
   A. FONT: ARIAL BOLD
   B. HEIGHT: 10"
5. RACEWAY MOUNT ALL SYMBOLS AND LETTERS PER MANUFACTURER STANDARD INSTALLATION DETAILS.
6. ALL CONDUIT, TRANSFORMERS AND WIRING SHALL NOT BE VISIBLE ON THE EXTERIOR OF THE BUILDING. COORDINATE WITH ELECTRICAL DRAWINGS.



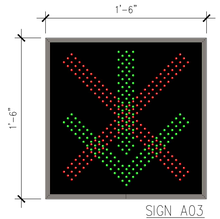
SIGN A01

SIGN A02

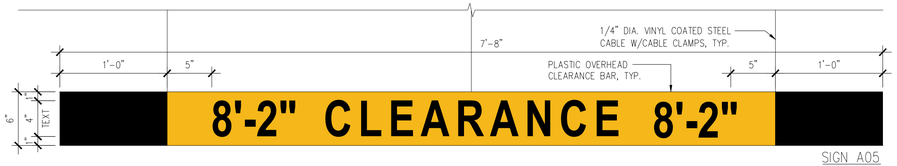
NOTES FOR SIGN A03 AND A04 :
– THESE SIGNS ARE ELECTRIC SIGNAGE. COORDINATE ELECTRICAL DRAWING.



SIGN A04

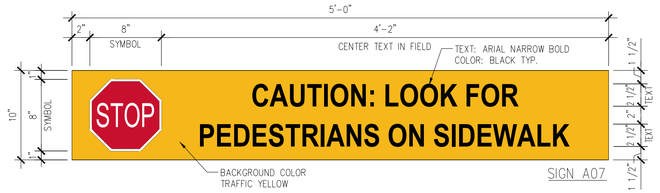


SIGN A03

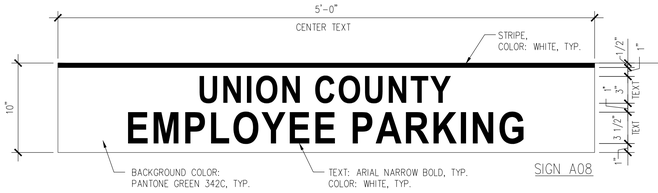


SIGN A05

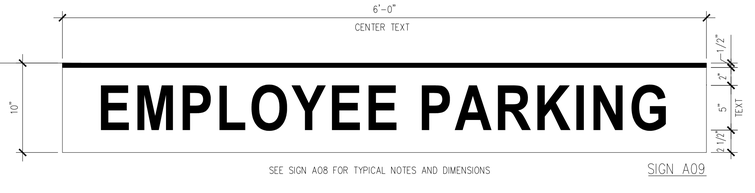
SIGN A06



SIGN A07



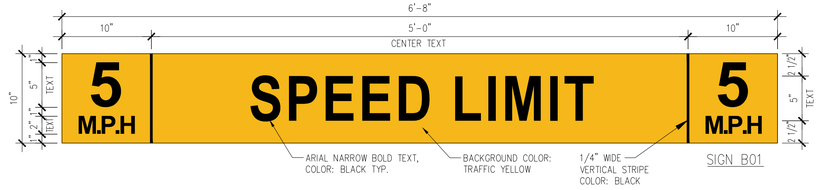
SIGN A08



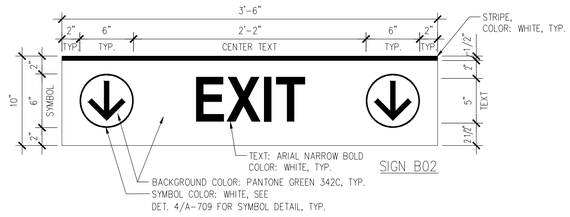
SIGN A09

1 A-708 TYPE A. SIGNAGE DETAILS

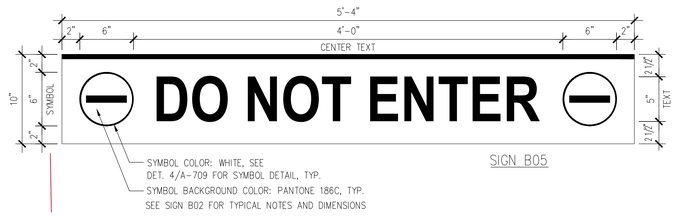
SCALE : N.T.S.



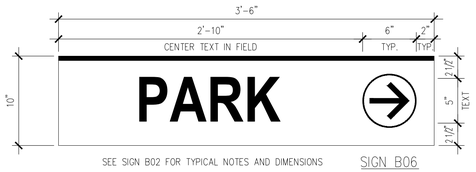
SIGN B01



SIGN B02

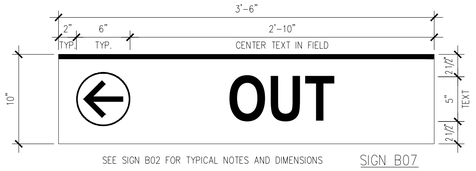


SIGN B05



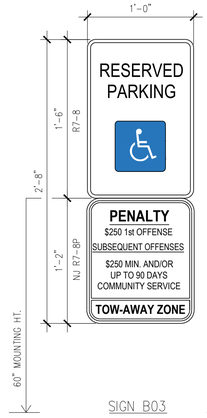
SEE SIGN B02 FOR TYPICAL NOTES AND DIMENSIONS

SIGN B06

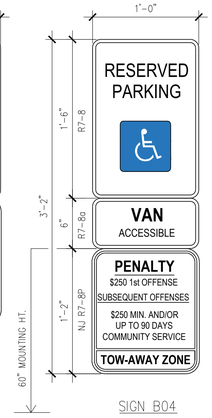


SEE SIGN B02 FOR TYPICAL NOTES AND DIMENSIONS

SIGN B07



SIGN B03



SIGN B04

2 A-708 TYPE B. SIGNAGE DETAILS

SCALE : 1-1/2" = 1' - 0"

NETTAARCHITECTS
1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2090
CERTIFICATE OF AUTHORIZATION AC-438

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SIGNAGE DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

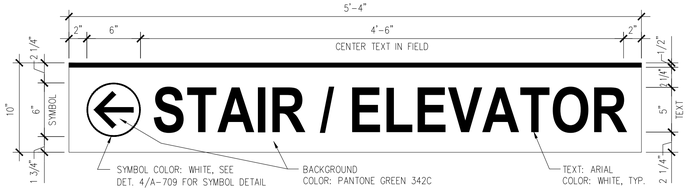
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-708

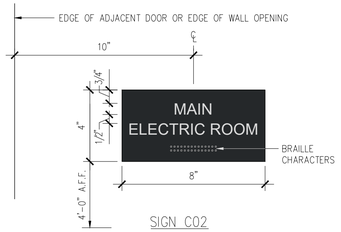


SIGN C01A

SIGN C01B, SIM.

SIGN NOTES:

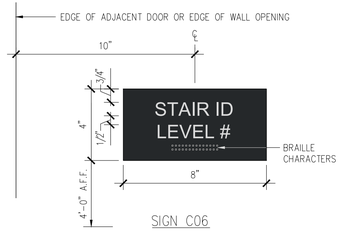
1. SEE SIGNAGE GENERAL NOTES SECTION B.
2. COORDINATE SIGN TEXT WITH ROOM DESIGNATIONS IN PLANS AND ROOM FINISH SCHEDULE. PROVIDE ROOM SIGN SCHEDULE FOR APPROVAL.
3. CENTER TACTILE TEXT AND BRAILLE CHARACTERS HORIZONTALLY ON SIGN.
4. BACKGROUND COLOR: PANTONE 426C
5. TEXT
   A. FONT: ARIAL
   B. COLOR: WHITE
   C. HEIGHT: 5/8"



SIGN C02

SIGN NOTES:

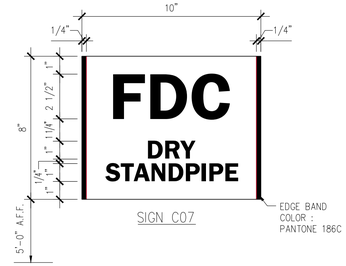
1. SEE SIGNAGE GENERAL NOTES SECTION B.
2. CENTER TACTILE TEXT AND BRAILLE CHARACTERS ON SIGN.
3. STAIR "ID" AND LEVEL "#" TO CORRESPOND WITH PLAN DESIGNATIONS.
4. BACKGROUND COLOR: PANTONE 426C
5. TEXT
   A. FONT: ARIAL
   B. COLOR: WHITE
   C. HEIGHT: 3/4"



SIGN C06

SIGN NOTES:

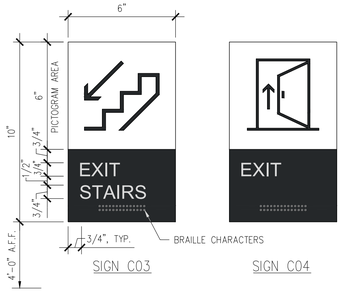
1. SIGN TO BE 0.080 THICK ALUMINUM, SEE SIGNAGE GENERAL NOTES PARAGRAPH C.4.
2. LOCATE ABOVE EXTERIOR BUILDING FIRE DEPARTMENT CONNECTIONS AND ADJACENT TO EACH STANDPIPE CONNECTION LOCATION.
3. BACKGROUND OF SIGN SHALL BE NON-REFLECTIVE SILK SCREENED, COLOR: WHITE.
4. CENTER TEXT HORIZONTALLY ON SIGN.
5. TEXT:
   A. FONT: ARIAL
   B. COLOR: PMS 186C
   C. HEIGHT: AS SHOWN



SIGN C07

SIGN NOTES:

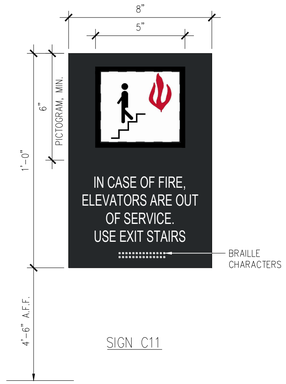
1. SEE SIGNAGE GENERAL NOTES SECTION B.
2. CENTER BRAILLE CHARACTORS HORIZONTALLY ON SIGN.
3. CENTER SYMBOL HORIZONALLY AND VERTICALLY IN PICTOGRAM AREA
4. BACKGROUND COLORS: PANTONE 426C, WHITE
4. SYMBOL COLOR: PANTONE 426C
5. TEXT
   A. FONT: ARIAL
   B. COLOR: WHITE
   C. HEIGHT: 3/4"



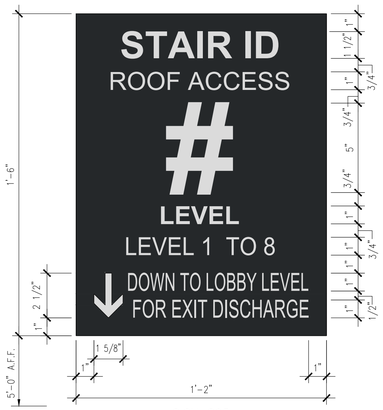
SIGN C03 SIGN C04

SIGN NOTES:

1. SEE SIGNAGE GENERAL NOTES SECTION B.
2. CENTER BRAILLE CHARACTORS HORIZONTALLY ON SIGN.
3. CENTER SYMBOL HORIZONALLY AND VERTICALLY IN PICTOGRAM AREA
4. BACKGROUND COLOR: PANTONE 426C
5. SYMBOL COLORS: BLACK, WHITE, PANTONE RED 186 C
6. TEXT
   A. FONT: ARIAL NARROW WIDTH FACTOR .85
   B. COLOR: WHITE
   C. HEIGHT: 5/8"



SIGN C11



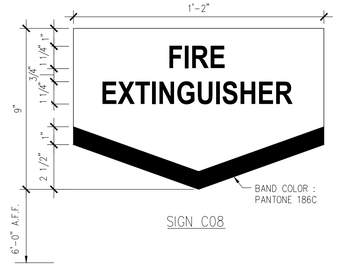
SIGN C05

SIGN NOTES:

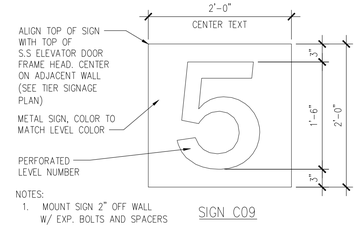
1. MATERIAL: 1/4" EXTERIOR GRADE PHOTOPOLYMER.
   A. BACKGROUND COLOR: PANTONE 426C.
   B. TEXT COLOR: WHITE
2. FONT: ARIAL. SEE DETAIL FOR ADDITIONAL INFORMATION.
3. CENTER ALL TEXT HORIZONTALLY UNLESS SHOWN OTHERWISE.
4. ALL TEXT AND SYMBOLS TO BE TACTILE.
5. "#" AN STAIR "ID" TO CORRESPOND WITH PLAN DESIGNATIONS.
6. OMIT "DOWN TO" AND ARROW SYMBOL AT LEVEL "1" AND CENTER ALL TEXT HORIZONTAL ON SIGN.

SIGN NOTES:

1. SIGN TO BE 0.080" THICK ALUMINUM, SEE SIGNAGE GENERAL NOTES PARAGRAPH C.4
2. LOCATE (1) SIGN DIRECTLY ABOVE FIRE EXTINGUISHER CABINET.
3. SEE ARCHITECT'S BUILDING CODE PLAN DIAGRAMS FOR FIRE EXTINGUISHER CABINET LOCATIONS
4. BACKGROUND OF SIGN SHALL BE NON-REFLECTIVE SILK-SCREENED, COLOR: WHITE
5. CENTER TEXT HORIZONTALLY ON SIGN.
6. TEXT
   A. FONT: ARIAL NARROW
   B. COLOR: BLACK
   C. HEIGHT: 1 1/4"

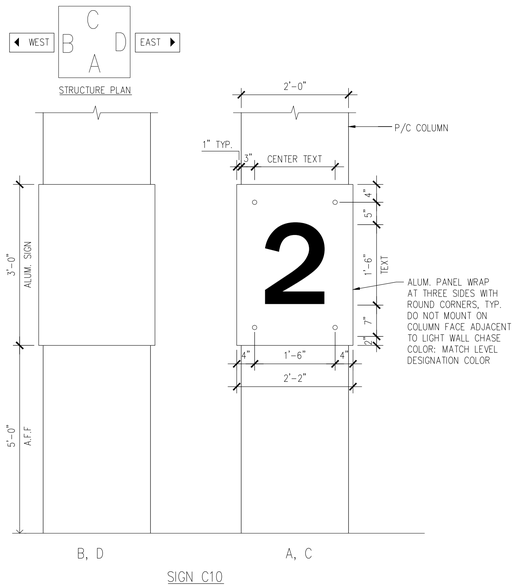


SIGN C08

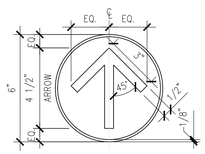


NOTES:
1. MOUNT SIGN 2" OFF WALL W/ EXP. BOLTS AND SPACERS

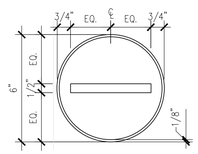
SIGN C09



SIGN C10



TRAFFIC SYMBOL



TRAFFIC SYMBOL

1 A-709 TYPE C. SIGNAGE DETAILS
SCALE : N.T.S.

2 A-709 TYPE C. SIGNAGE DETAILS
SCALE : N.T.S.

3 A-709 TYPE C. SIGNAGE DETAILS
SCALE : N.T.S.

4 A-709 SYMBOL DETAILS
SCALE : 6" = 1' - 0"

NETTAARCHITECTS
237 West 35th Street
Suite 1004
New York, NY 10004
Phone: 212.777.2686
CERTIFICATE OF AUTHORIZATION AC-438

1084 Route 22 West
Mountainside, NJ 07092
Phone: 973.379.0006
www.nettaarchitects.com

NICHOLAS J. NETTA, AIA, NCARB
NJ License No. AI 12541

THA CONSULTING
550 Township Line Road, Suite 100 TEL 484.342.0200
Blue Bell, PA, 19422

SHEET CONTENTS:

SIGNAGE DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

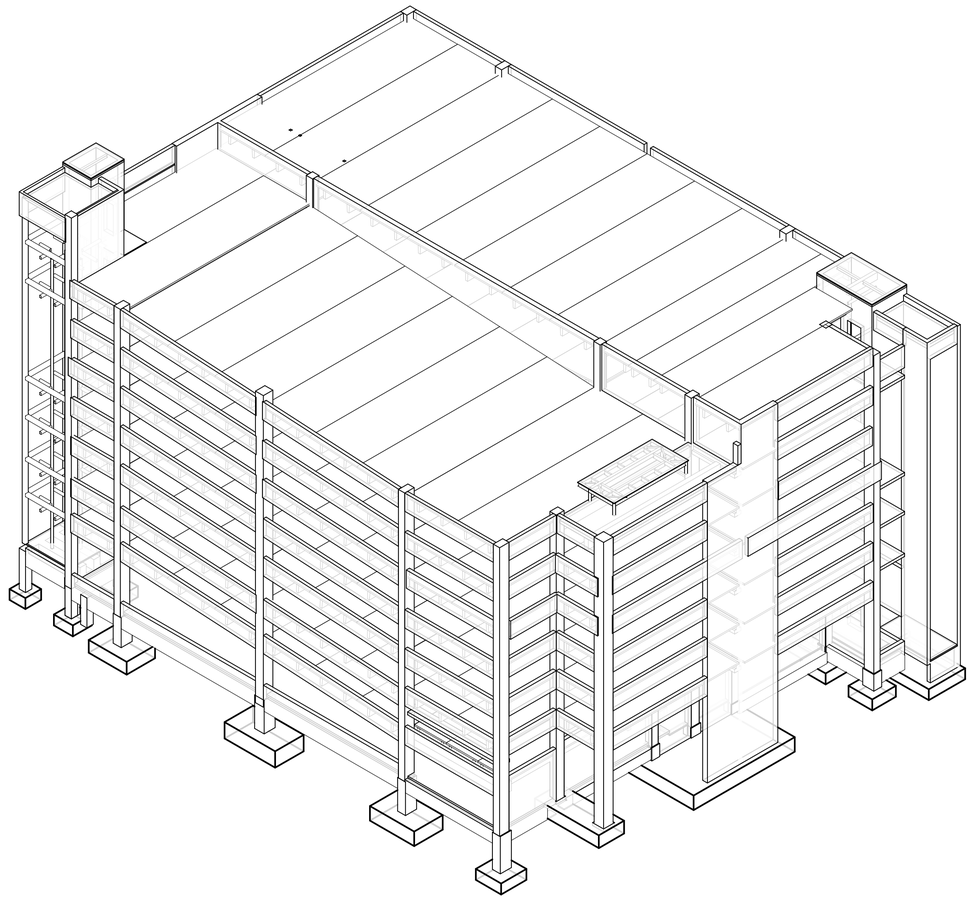
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	RG
Checked by	RM
Job No.	2201565

Drawing No.

A-709



UNION COUNTY PARKING GARAGE BUILDING H (3D VIEW)

SCALE:

NOTE: 3D VIEW IS SHOWN FOR PROJECT CONCEPT ONLY. (N.T.S.)

STRUCTURAL DRAWING LIST

	SHEET NAME	PROGRESS SET 5/28/2021	ISSUED FOR BIDDING 7/28/2021
S000	COVER SHEET	●	●
S-100	FOUNDATION - TIER 1 FLOOR PLAN	●	●
S-101	TIER 2 FLOOR FRAMING PLAN	●	●
S-102	TIER 3 FLOOR FRAMING PLAN	●	●
S-103	TIER 4 FLOOR FRAMING PLAN	●	●
S-104	TIER 5 - 7 FLOOR FRAMING PLAN	●	●
S-105	TIER 8 FLOOR & DUNNAGE FRAMING PLANS	●	●
S-106	ROOF TIER FRAMING PLAN	●	●
S-200	GENERAL NOTES & SCHEDULES	●	●
S-201	SPECIAL INSPECTIONS 1	●	●
S-202	SPECIAL INSPECTIONS 2	●	●
S-300	TYPICAL FOUNDATION DETAILS	●	●
S-301	FOUNDATION SECTIONS & DETAILS	●	●
S-302	FOUNDATION SECTIONS	●	●
S-303	PRECAST COLUMNS		●
S-400	TYPICAL FRAMING DETAILS	●	●
S-401	TYPICAL FRAMING DETAILS	●	●
S-402	TYPICAL FRAMING DETAILS	●	●
S-403	FRAMING SECTIONS	●	●
S-404	FRAMING SECTIONS	●	●
S-500	SHEARWALL ELEVATIONS	●	●
S-501	SHEARWALL ELEVATIONS 2	●	●
S-600	SECOND TIER CIP WASH & DIAPHRAGM REINFORCEMENT PLANS	●	●
S-601	TYPICAL CAST-IN-PLACE WASH & FLOOR DIAPHRAGM REINFORCING PLANS	●	●
S-602	CIP WASH & DIAPHRAGM REINFORCEMENT DETAILS	●	●

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

COVER SHEET

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

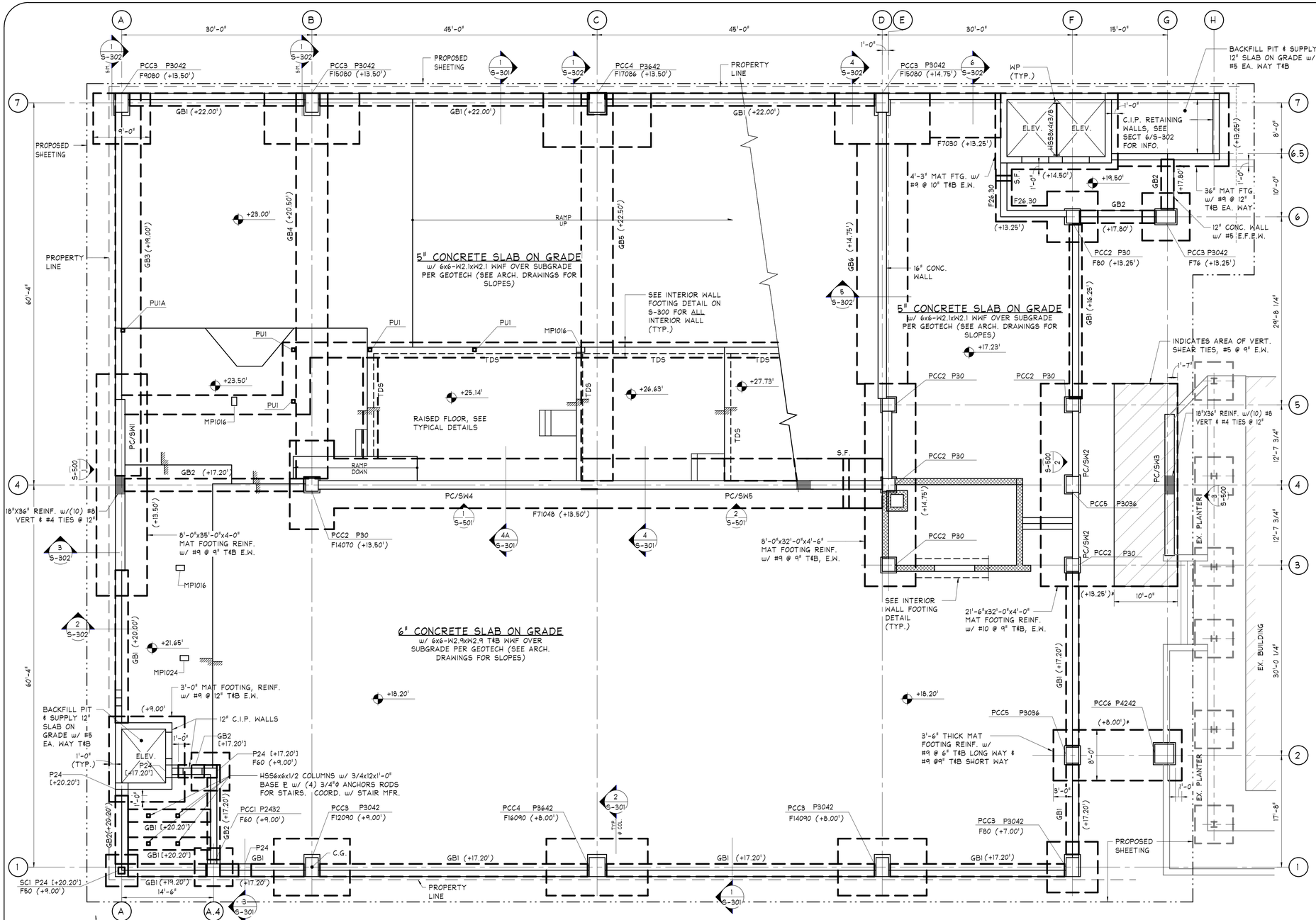
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S000



FOUNDATION/TIER 1 FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) FINISHED FLOOR ELEVATION VARIES, SEE PLAN AND COORDINATE WITH ARCHITECTURAL DRAWINGS (ACTUAL ELEVATION +18.20').

2) ( ) INDICATES TOP OF FOUNDATION ARE ACTUAL ELEVATIONS.

3) SEE S-200 FOR COLUMN, PIER, FOOTING AND GRADE BEAM SCHEDULES AND PILE CAP INFORMATION.

4) FOUNDATIONS, COLUMNS AND PIERS ARE CENTERED ON THE GRID LINE, UNLESS NOTED OTHERWISE, SEE ARCH. DRAWINGS.

5) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS, & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 POUNDS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

6) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS & ELEVATIONS. DIMENSIONS & ELEVATIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS & ELEVATIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

7) [ ] INDICATES TOP OF PIER ELEVATOIN REALATIVE TO RELEVATION +18.20'. ALL TOP OF PIER ELEVATIONS NOT SHOWN SEE ARCH. & COORDINATE w/ P/C MFR.

8) FOOTINGS AND PIERS SUPPORTING MORE THAN ONE COLUMN SHALL BE CENTERED BETWEEN THEM IN BOTH DIRECTIONS, UNLESS NOTED OTHERWISE.

9) "SW" INDICATES P/C CONCRETE SHEARWALL, SEE SCHEDULE ON S-500.

10) SEE DRAWING SHEETS S-500 & S-501 FOR SHEARWALL LOADING DIAGRAMS.

11) "PCC_" INDICATES PRECAST CONCRETE COLUMN, SEE PLAN DETAILS ON SHEET S-303 FOR INFO.

12) ALL CONNECTIONS OF STEEL FRAMING TO PRECAST ELEMENTS SHALL UTILIZE A PRECAST WALL PL ("PCWP"). THIS EMBEDDED WALL PL SHALL BE DESIGNED BY THE PRECAST MANUFACTURER FOR MINIMUM UNFACTORED REACTIONS SHOWN ON PLAN. ANY EXPOSED WALL PL'S SHALL BE HOT-DIPPED GALVANIZED.

13) COORDINATE ALL UNDERGROUND UTILITY REQUIREMENTS WITH CIVIL/MEP DRAWINGS. ALL UTILITIES SHALL BE ABOVE/BELOW GRADE BEAM/PILE CAP AND NOT LOCATED WITHIN FOUNDATION ELEMENTS.

14) "SC1" INDICATES HSS12x12x1/2 w/ 3/4x18x1'-6" BASE PL w/ (4) 3/4"ø ANCHOR BOLTS.

15) AT 12" C.I.P. WALLS PROVIDE #6 @ 12" VERT. & #5 @ 12" HORIZ., U.N.O.

16) X.XX' INDICATES ACTUAL ELEVATION OF SLAB ON GRADE; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL TOP OF SLAB ELEVATIONS AND SLOPES AND MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

17) SEE ARCH/MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

18) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

19) "RWC" INDICATES RAINWATER CONDUCTOR LOCATION. TOP OF PILE CAP TO BE (-2.00') BELOW SLAB ON GRADE (MIN.). COORDINATE WITH LOCATIONS SHOWN ON CIVIL/PLUMBING DRAWINGS.

20) ALL FOOTING SHALL BEAR ON ON ROCK (16,000 PSF BEARING CAPACITY), IF NOT, PROVIDE LEAN CONCRETE TTO REACH ROCK ELEVATION. REFER TO GEOTECH REPORT FOR ROCK ELEVATIONS.

21) COORDINATE w/ PRECAST MFR. FOR P/C COLUMN & SPANDREL ELEVATION & CONNECTION TO C.I.P. COLUMN & WALLS.

22) "PU1" INDICATES HSS6x6x3/8 w/ 3/4x8x1'-0" BASE PL w/ (4) 3/4"ø ANCHORS RODS, ON THICKENED SLAB. "PU1A" INDICATES HSS6x6x3/8 w/ 3/4x8x1'-0" BASE PL w/ (4) 3/4"ø ANCHORS RODS, ON GRADE BEAM.

23) "WP" INDICATES EMBEDDED WALL PL, PROVIDE 15 KIP REACTION.

24) "TDS" INDICATES THICKENED SLAB, SEE DETAIL ON S-300, OR INTERIOR WALL FOOTING.

25) "#" INDICATES BOTTOM OF FOOTING ELEVATION TO MATCH BOTTOM OF EXISTING FOOTING ELEVATION (V.I.F.).

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No.: 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

FOUNDATION - TIER 1 FLOOR PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

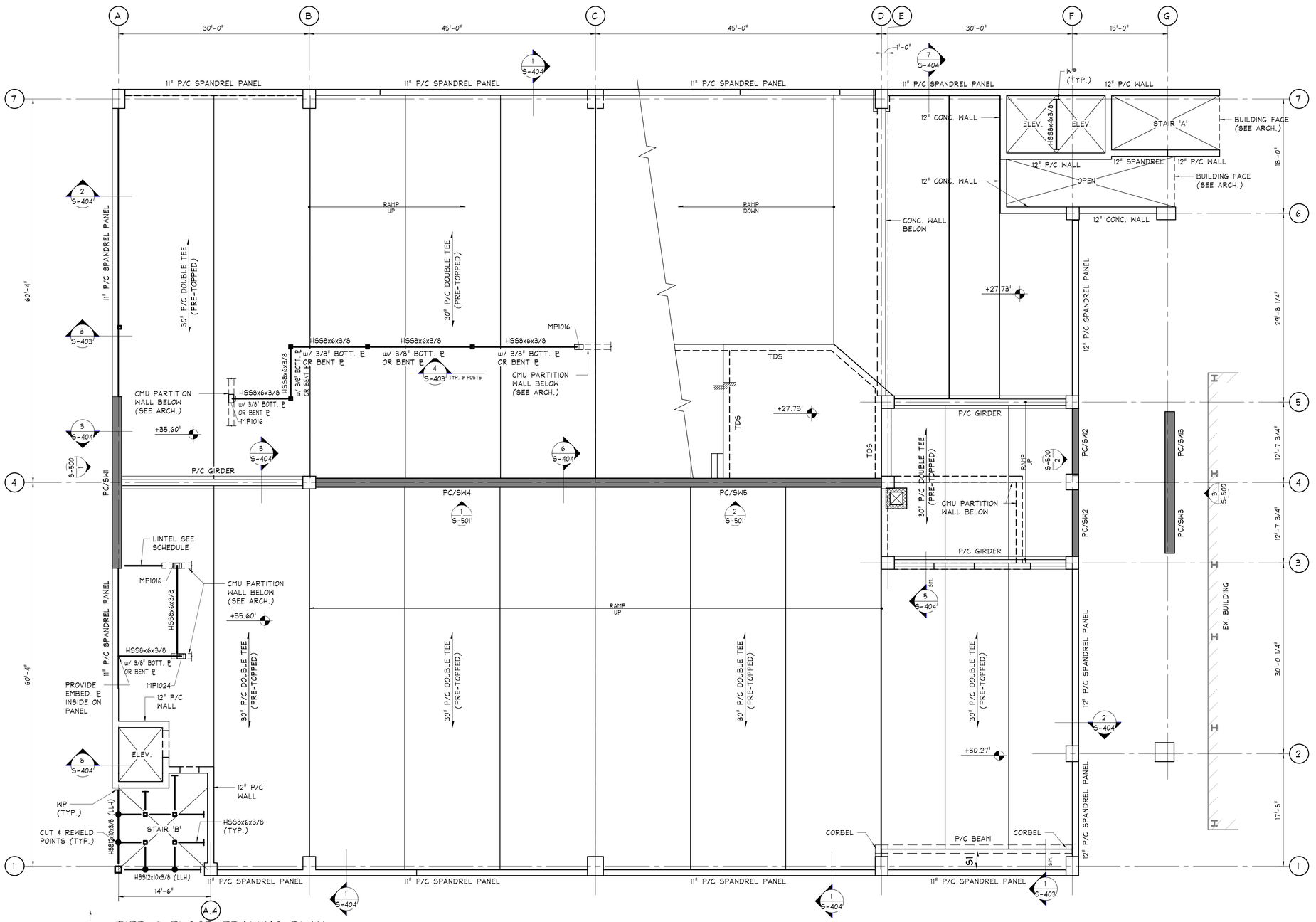
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-100



TIER 2 FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) ▭ INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL PL DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED PL'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

11) 5I INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED PL'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "MPI016" INDICATES MASONRY 10"X16" CMU PIER, w/ (4)#4 VERT & #2 TIES @8"

16) "WP" INDICATES EMBEDDED WALL PL, PROVIDE 15 KIP REACTION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TIER 2 FLOOR FRAMING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

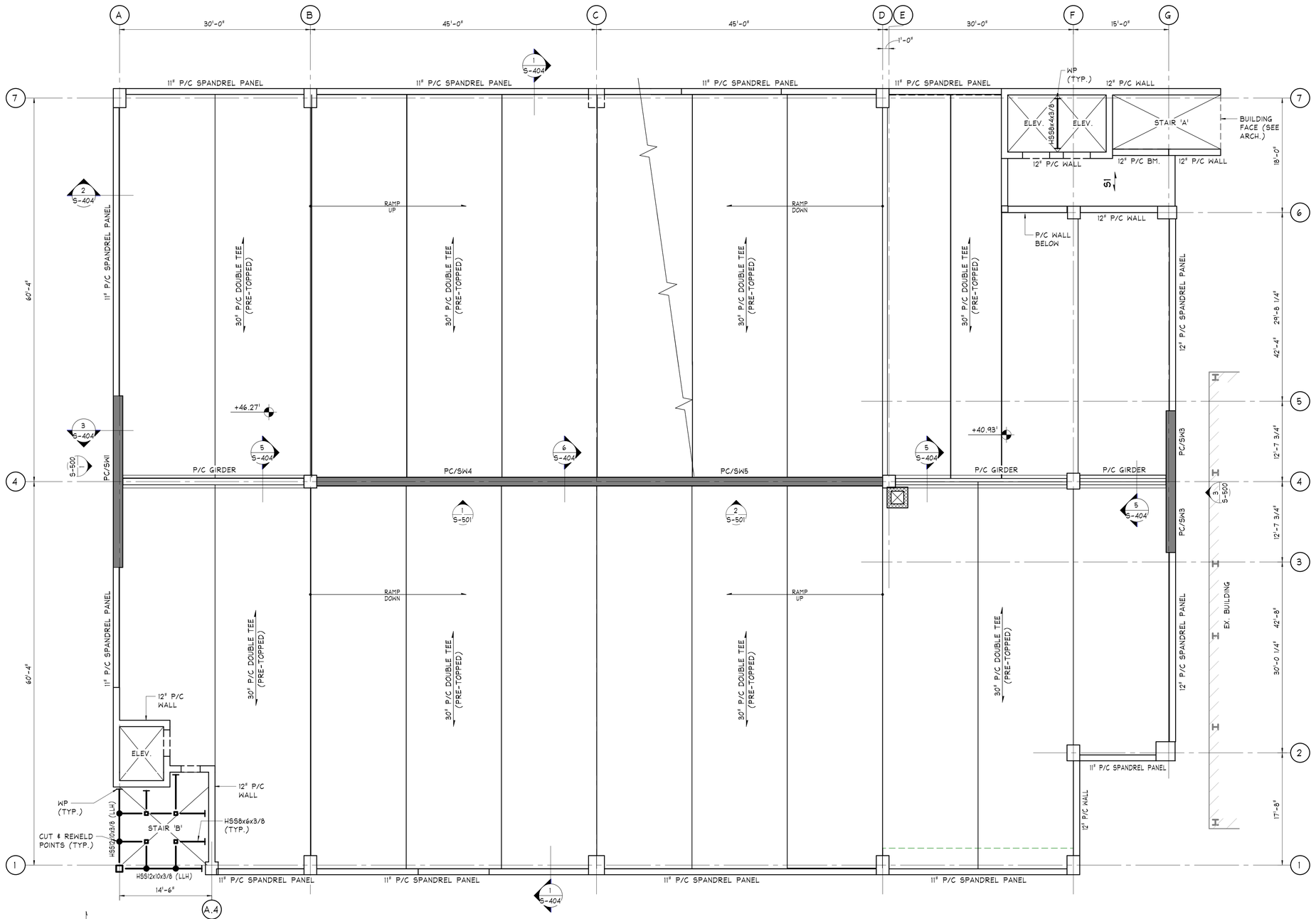
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-101



TIER 3 FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) ▬ INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL ℄ DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED ℄'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) "PCG_" INDICATES P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

11) S1 INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED ℄'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "WP" INDICATES EMBEDDED WALL ℄ IN P/C/ WALL. PROVIDE 15 KIP REACTION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TIER 3 FLOOR FRAMING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

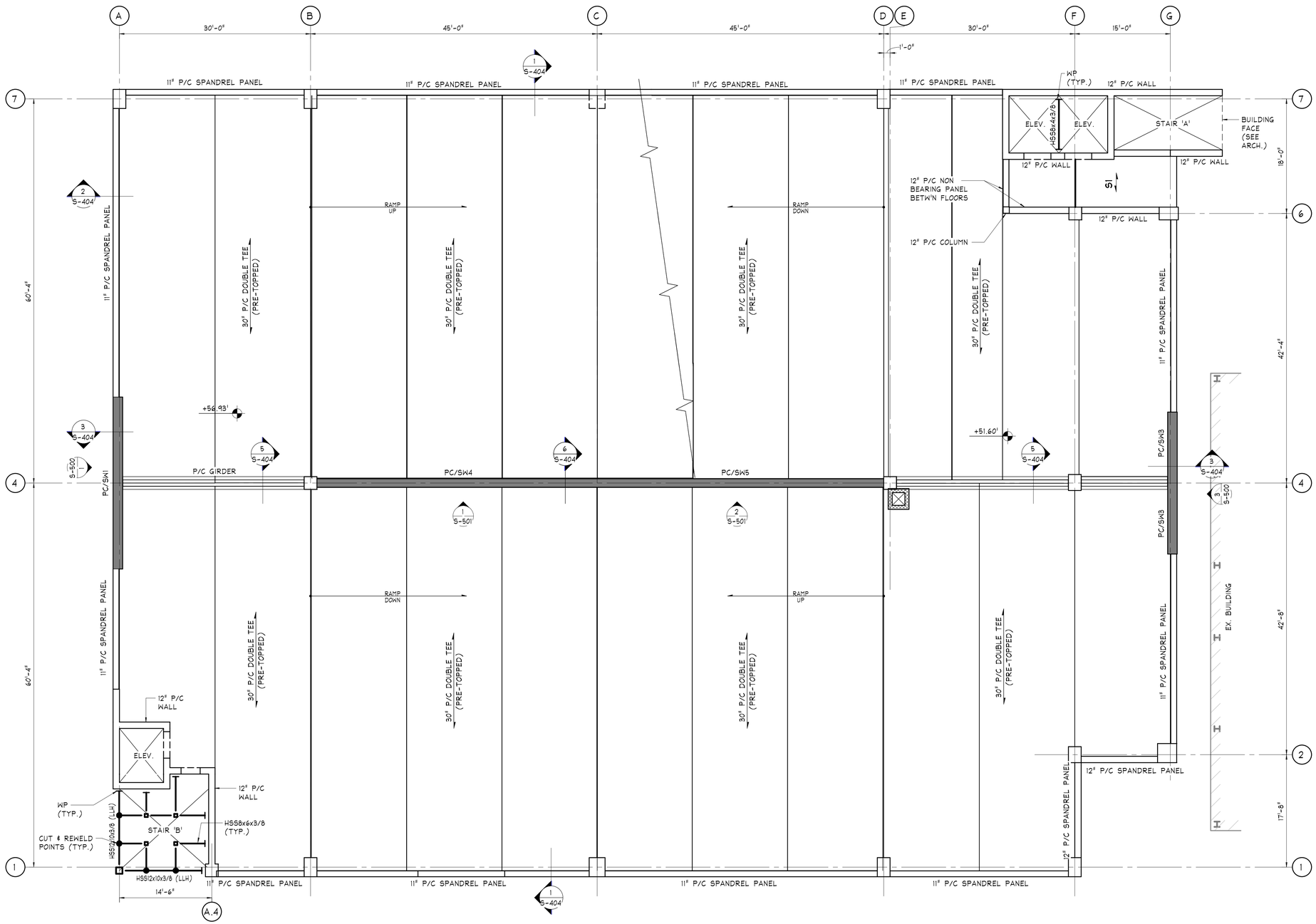
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-102



TIER 4 FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) ▭ INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL ℄ DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED ℄'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) "PCG_" INDICATES P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

11) ← S1 → INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED ℄'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "WP" INDICATES EMBEDDED WALL ℄ IN P/C/ WALL. PROVIDE 15 KIP REACTION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TIER 4 FLOOR FRAMING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

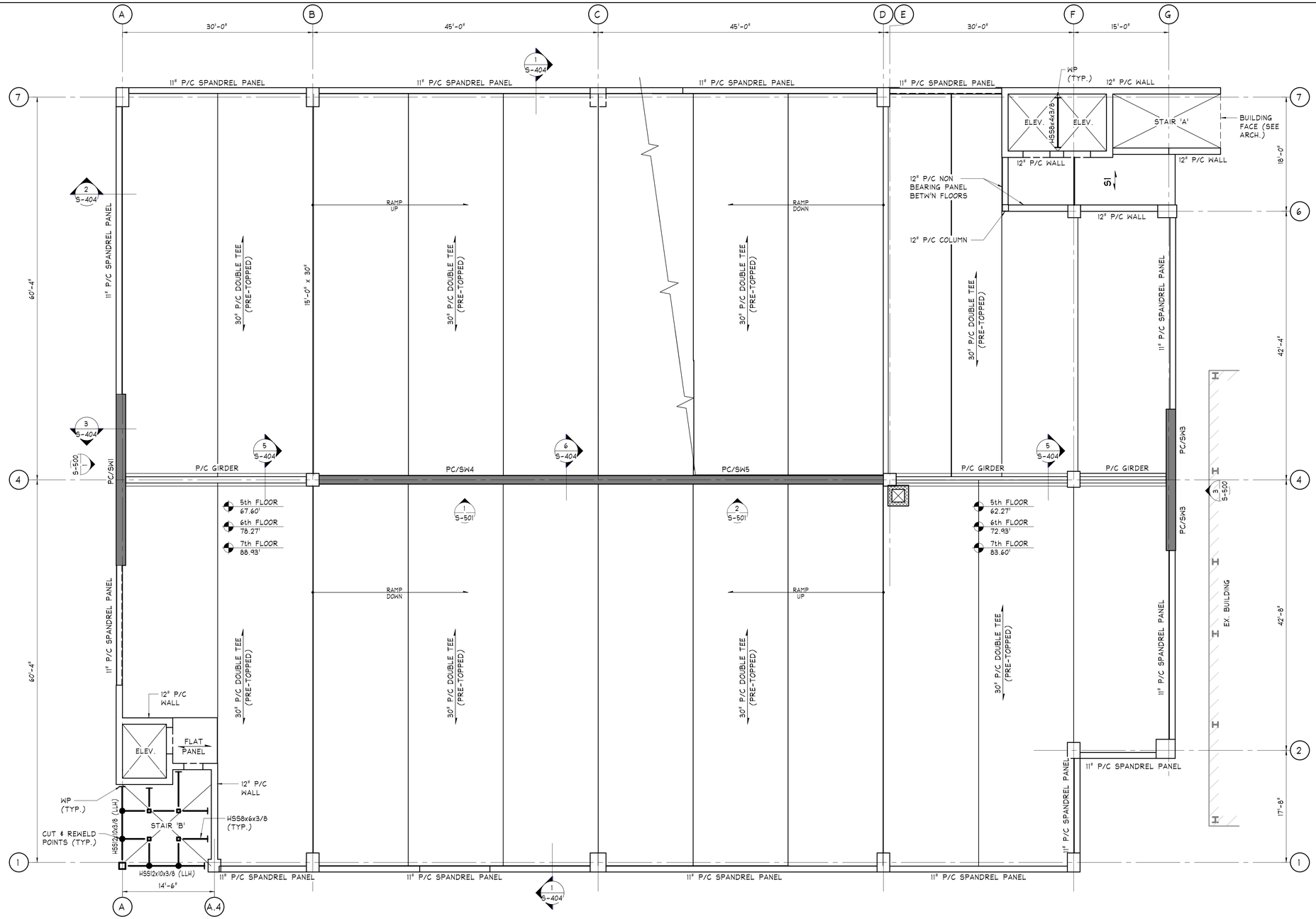
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-103



TIER 5 - 7 FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) ▭ INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL ℄ DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED ℄'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) "PCG_" INDICATES P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

11) S1 INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED ℄'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "WP" INDICATES EMBEDDED WALL ℄ IN P/C/ WALL. PROVIDE 15 KIP REACTION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TIER 5 - 7 FLOOR FRAMING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

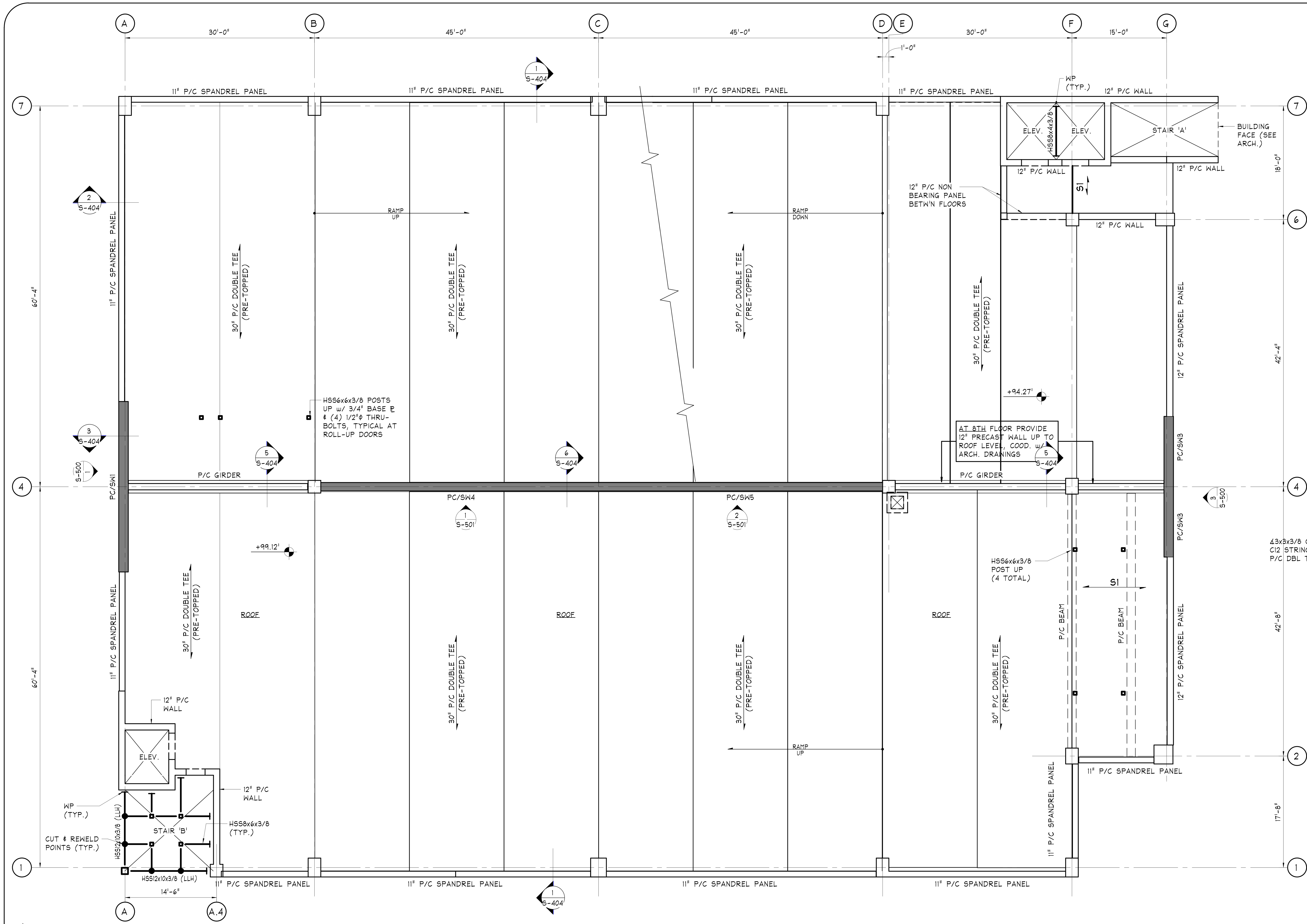
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-104



TIER 8 FLOOR FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) [shaded box] INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL PL DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED PL'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) "PCG_" INDICATES P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

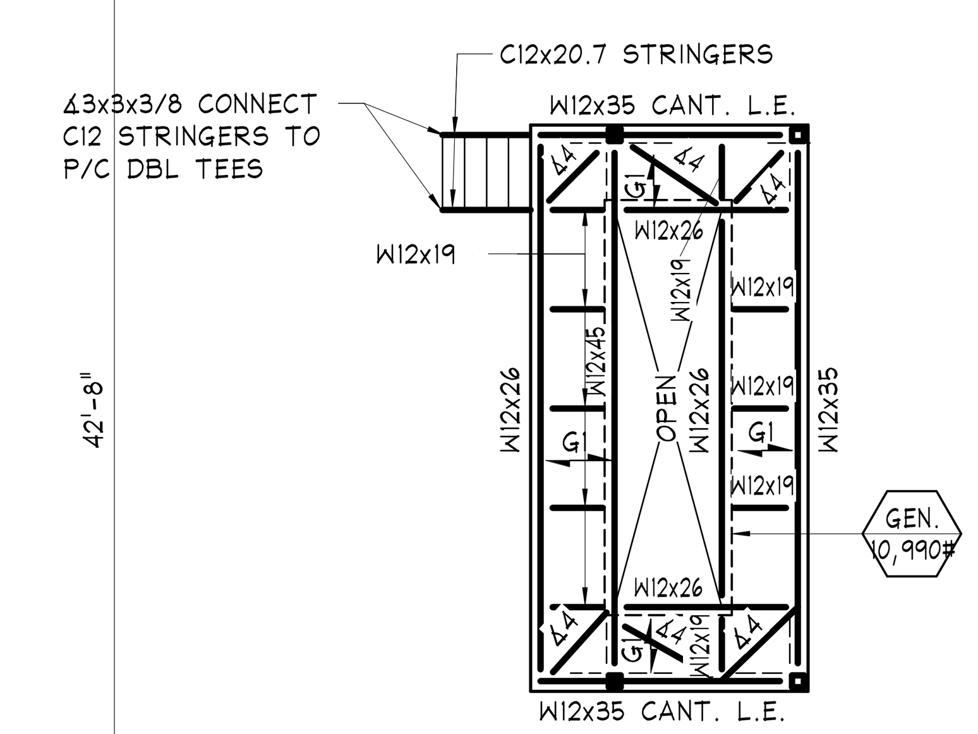
11) S1 INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED PL'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "WP" INDICATES EMBEDDED WALL PL IN P/C/ WALL. PROVIDE 15 KIP REACTION.



DUNNAGE FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) TOP OF STEEL BEAM ELEVATION 3'-6" ABOVE FIN. FLR. ELEVATION. COORDINATE w/ MECH. DRAWINGS.

2) "G1" INDICATES SPAN OF PRESSURE LOCK TYPE 'WB' MFR. BY IKG INDUSTRIES. MAIN BARS TO BE 1 1/2"x3/16" o/c & CROSS BARS TO BE RECTANGULAR FLUSH, SPACED @ 4" o/c.

3) ALL EXTERIOR EXPOSED DUNNAGE STEEL: MEMBERS, PLATES & HARDWARE SHALL BE HOT DIP GALVANIZED.

4) UNIT TO BE CENTERED ON STRUCTURAL MEMBERS. COORDINATE ALL DIMENSIONS w/ MECH. PRIOR TO ANY FABRICATION.

5) "∠4" INDICATES ∠4x4x3/8.

6) "— — —" INDICATES KNEE BRACE, SEE TYPICAL DETAIL.

7) SEE ARCH. DRAWINGS FOR HANDRAIL INFORMATION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TIER 8 FLOOR & DUNNAGE FRAMING PLANS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

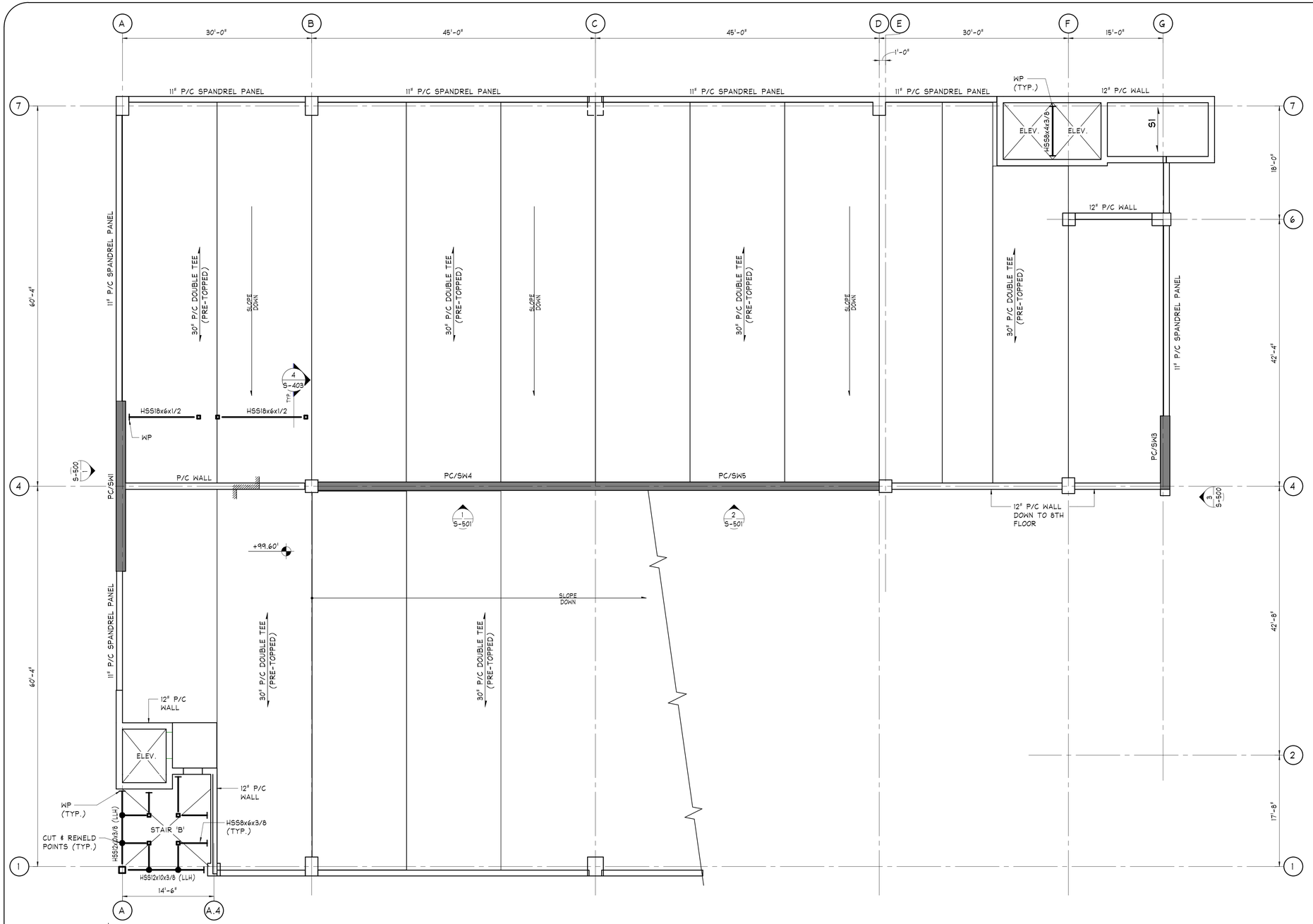
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-105



ROOF TIER FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) SEE PLAN FOR FINISHED FLOOR ELEVATIONS RELATIVE TO ELEVATION 18.20'. COORDINATE ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS.

2) SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT INDICATED.

3) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS. DIMENSIONS ON THIS DRAWING ARE FOR CONVENIENCE ONLY AND MUST BE CHECKED WITH THE ARCHITECTURAL DRAWINGS FOR ACCURACY. DIMENSIONS ON THE ARCHITECTURAL DRAWINGS GOVERN.

4) ▭ INDICATES PRECAST CONCRETE SHEARWALL, SEE SCHEDULE ON SHEET S-500 AND S-501.

5) SEE DRAWING SHEETS S-600 FOR SHEARWALL LOADING DIAGRAMS.

6) "PCWP" INDICATES EMBEDDED WALL ℄ DESIGNED BY P/C MFR. FOR REACTIONS INDICATED ON PLAN. ANY EXPOSED ℄'S SHALL BE HOT-DIP GALVANIZED.

7) SEE ARCH./MEP DOCUMENTS FOR ALL WATERSTOP AND WATERPROOFING REQUIREMENTS.

8) "PCG_" INDICATES P/C GIRDER TO BE DESIGNED BY P/C MFR.

9) PRECAST MANUFACTURER TO COORDINATE DESIGN OF DOUBLE TEES TO ACCOMODATE WEIGHT OF PRECAST BOLLARDS, COORDINATE WITH ARCH. DRAWINGS.

10) X'-XX" ◢ INDICATES TOP OF DOUBLE TEE ELEVATION WITH RESPECT TO FLOOR ELEVATION; THESE ELEVATIONS ARE SHOWN FOR INFORMATION ONLY. ALL ELEVATIONS AND SLOPES MUST BE COORDINATED WITH ARCH./CIVIL DRAWINGS.

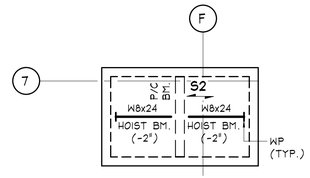
11) S1 ⟵ INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK WITH 2" TOPPING REINFORCED WITH 6x6 - W1.4xW1.4 WWF.

12) P/C MFR. TO DESIGN ALL WALLS, SPANDREL PANELS & CONNECTIONS FOR A VEHICULAR IMPACT FORCE OF 6,000 LBS @ 1'-6" TO 2'-3" ABOVE FINISHED FLOOR PER IBC/ASCE-7.

13) COORDINATE ALL CAST-IN-PLACE EMBED ℄'S REQUIRED FOR MISCELLANEOUS STAIR AND ELEVATOR COMPONENTS WITH STAIR/ELEVATOR MFR. AS REQUIRED.

14) PERIMETER RETAINING WALLS TO BE BACKFILLED FULL PER GEOTECHNICAL REQUIREMENTS PRIOR TO SETTING PRECAST ELEMENTS. SEE GEOTECHNICAL ENGINEERING REPORT FOR ALL REQUIREMENTS.

15) "WP" INDICATES EMBEDDED WALL ℄ IN P/C/ WALL. PROVIDE 15 KIP REACTION.



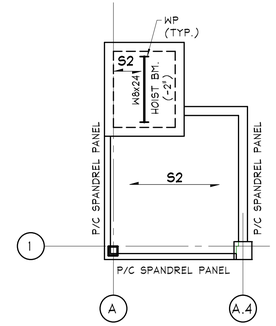
ELEVATOR 'A' ROOF FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) TOP OF PLANK ELEVATION SEE ARCH. DRAWINGS

2) "S2" INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK.



STAIR & ELEVATOR 'B' ROOF FRAMING PLAN

SCALE: 1/8" = 1'-0"

NOTES:

1) TOP OF PLANK ELEVATION SEE ARCH. DRAWINGS

2) "S2" INDICATES SPAN OF 8" SOLID CORE PRECAST PLANK.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

ROOF TIER FRAMING PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-106

GENERAL CONSTRUCTION

1. NOTES, TYPICAL DETAILS, AND SCHEDULES APPLY TO ALL STRUCTURAL WORK UNLESS NOTED OTHERWISE. TYPICAL DETAILS ARE TO BE USED FOR ALL CONDITIONS WHERE THE DETAIL IS APPLICABLE, WHETHER OR NOT NOTED ON PLAN. TYPICAL DETAILS MAY BE SLIGHTLY ALTERED IF REQUIRED DUE TO PROJECT CONDITIONS, ONLY WHEN SUBMITTED AND THE ENGINEER'S APPROVAL IS OBTAINED PRIOR TO PERFORMING THE WORK.

2. ALL DIMENSIONS AND ELEVATIONS SHOWN ON STRUCTURAL DRAWINGS, WITH THE EXCEPTION OF STRUCTURAL MEMBER SIZES, ARE GENERATED BY OTHER DISCIPLINES. ANY DIMENSIONS OR ELEVATIONS OMITTED OR NOT SHOWN ON THE STRUCTURAL DRAWINGS SHOULD BE OBTAINED FROM THE DRAWINGS OF THE OTHER DISCIPLINES. STRUCTURAL DRAWINGS ARE NOT "STAND-ALONE" DOCUMENTS AND SHOULD BE USED IN CONJUNCTION WITH, AND COORDINATED WITH THE SPECIFICATIONS, ARCHITECTURAL DRAWINGS AND ALL OTHER DISCIPLINE'S DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ENGINEER AND ARCHITECT PRIOR TO PERFORMING THE WORK.

3. IF DIFFERENCES OCCUR WITHIN OR BETWEEN DRAWINGS AND SPECIFICATIONS REGARDING MATERIALS, STRENGTHS OR QUANTITIES, THE BETTER MATERIAL, HIGHER STRENGTH, AND GREATER QUANTITY INDICATED, SPECIFIED OR NOTED SHALL BE PROVIDED.

4. REPRODUCTIONS OF STRUCTURAL DRAWINGS FOR SUBMITTAL AS SHOP DRAWINGS IS PROHIBITED, UNLESS WRITTEN APPROVAL IS REQUESTED BY THE CONTRACTOR AND IT IS GRANTED BY O'DONNELL & NACCARATO, INC.

5. DO NOT SCALE DRAWINGS TO OBTAIN DIMENSIONAL INFORMATION.

6. THESE DRAWINGS DO NOT DEFINE SCOPE OF CONTRACTOR OR SUBCONTRACTOR CONTRACTS.

7. AT ALL TIMES, THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CONDITIONS OF THE JOBSITE INCLUDING MEANS AND METHODS OF CONSTRUCTION AND SAFETY OF PERSONS AND PROPERTY. THE ENGINEER'S PRESENCE OR REVIEW OF WORK AT THE JOBSITE IS FOR GENERAL COMPLIANCE WITH THE DESIGN INTENT ONLY AND IS NOT EVER TO BE CONSTRUED AS A REVIEW OF MEANS AND METHODS OF CONSTRUCTION AND SAFETY METHODS.

8. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING ALLOWABLE CONSTRUCTION LOADS AND FOR PROTECTING THE COMPLETED OR INCOMPLETED STRUCTURAL FRAMING FROM DAMAGE DUE TO TEMPORARY CONSTRUCTION LOADINGS.

9. COSTS OF INVESTIGATION AND/OR REDESIGN DUE TO CONTRACTOR ERRORS WILL BE AT THE CONTRACTOR'S EXPENSE.

10. ANY APPROVED CONTRACTOR REQUESTED CHANGES TO THESE DRAWINGS WILL BE DONE AT NO COST TO THE OWNER. APPROVAL OF CONTRACTOR REQUESTED CHANGES IN NO WAY STATES OR IMPLIES APPROVAL OF A CHANGE IN SCOPE OR CHANGE IN CONTRACT COST.

11. UNLESS EXPLICITLY NOTED AS "ISSUED FOR BID", THESE DRAWINGS ARE NOT SUITABLE FOR OBTAINING BIDS FROM GENERAL OR SUBCONTRACTORS. BIDDING OF DRAWINGS PRIOR TO DESIGN COMPLETION AND "ISSUED FOR BID" IS DONE AT THE SOLE RISK OF THE BIDDING CONTRACTOR. ADDITIONS OR CORRECTIONS TO DRAWINGS THAT ARE BID PRIOR TO DESIGN COMPLETION AND "ISSUED FOR BID" WILL NOT BE CONSIDERED AS DESIGN ERRORS OR OMISSIONS. STRUCTURAL DESIGN, BY NATURE, CANNOT BE COMPLETE PRIOR TO COMPLETION OF ARCHITECTURAL AND MECHANICAL DRAWINGS.

12. ALL REFERENCES TO WATER/DAMPROOFING, FIREPROOFING, AND UTILITIES ON THE STRUCTURAL DRAWINGS ARE FOR REFERENCE ONLY. SEE ARCHITECTURAL DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS FOR ALL WATER/DAMPROOFING, FIREPROOFING AND UTILITIY DETAILS AND REQUIREMENTS. COORDINATE ALL UNDERGROUND UTILITY REQUIREMENTS WITH THE CIVIL/MEP DRAWINGS. ALL UTILITES SHALL BE ABOVE/BELOW FOOTING AND NOT LOCATED WITHIN THE FOOTINGS. NOTIFY ENGINEER OF RECORD IF OTHERWISE.

13. IF THE EXISTING FIELD CONDITIONS DO NOT PERMIT THE INSTALLATION OF THE WORK IN ACCORDANCE WITH THE DETAILS SHOWN, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY. THE CONTRACTOR MUST PROVIDE A SKETCH OF THE CONDITION WITH HIS PROPOSED MODIFICATION OF THE DETAILS GIVEN ON THE CONTRACT DOCUMENTS. THIS SKETCH MUST BE SUBMITTED TO AND APPROVAL MUST BE GRANTED BY THE ENGINEER PRIOR TO PERFORMING THE WORK.

14. SUBMIT SHOP DRAWINGS SUCH THAT BY THE TIME THEY ARE RECEIVED BY O'DONNELL & NACCARATO, INC., THERE WILL BE AT LEAST 14 DAYS BEFORE REVIEWED SUBMITTALS WILL BE NEEDED. ANY REVIEW THAT IS REQUIRED MORE EXPEDIENTLY WILL BE AT THE CONTRACTOR'S EXPENSE. [ENGINEER'S NOTE: REVIEW THIS NOTE WITH THE PROJECT EXECUTIVE, ESPECIALLY CONCERNING DESIGN-BUILD PROJECTS.] SHOP DRAWINGS SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT HE HAS VERIFIED ALL FIELD MEASUREMENTS, CONSTRUCTION CRITERIA, MATERIALS AND SIMILAR DATA AND HAS CHECKED EACH DRAWING FOR COMPLETENESS, COORDINATION AND COMPLIANCE WITH THE CONTRACT DOCUMENTS. IF REVIEW OF AN INCOMPLETE SHOP DRAWING IS REQUIRED, THAT SHOP DRAWING SHALL BE CLEARLY MARKED AS INCOMPLETE. THE AREA THAT NEEDS TO BE REVIEWED SHALL BE CLEARLY NOTED WITH AN EXPLANATION FOR THE REASON FOR PARTIAL APPROVAL.

15. IN NO CASE SHALL HEAVY EQUIPMENT BE PERMITTED CLOSER THAN 8'-0" FROM ANY FOUNDATION/BASEMENT WALL. IF THE CONTRACTOR DEEMS IT NECESSARY TO OPERATE SUCH EQUIPMENT CLOSER THEN 8'-0", THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE AND, AT HIS OWN EXPENSE, PROVIDE ADEQUATE SUPPORTS OR WALL BRACES TO WITHSTAND THE ADDITIONAL LOADS SUPERIMPOSED FROM SUCH EQUIPMENT.

16. SIZE AND/OR LOCATION OF OPENINGS, SLEEVES, CONCRETE HOUSEKEEPING PADS, INSERTS, DEPRESSIONS, ETC. SHOWN ON THE STRUCTURAL DOCUMENTS ARE FOR THE CONTRACTOR'S CONVENIENCE ONLY. THE CONTRACTOR IS SOLELY RESPONSIBLE TO COORDINATE ALL CONTRACT DOCUMENTS TO DETERMINE THE SIZE AND/OR LOCATION OF OPENINGS, SLEEVES, CONCRETE HOUSEKEEPING PADS, INSERTS, DEPRESSIONS, ETC.

17. SIZE AND/OR LOCATION OF EXISTING STRUCTURES AND UTILITIES SHOWN ON THE STRUCTURAL DOCUMENTS ARE FOR THE CONTRACTOR'S CONVENIENCE ONLY. THE CONTRACTOR IS SOLELY RESPONSIBLE TO VERIFY BY FIELD MEASUREMENTS/INVESTIGATION THE SIZE AND/OR LOCATION OF ALL EXISTING STRUCTURES AND UTILITIES.

18. THE CONTRACTOR SHALL SUBMIT SIGNED AND SEALED CALCULATIONS AND SHOP DRAWINGS BY A STRUCTURAL ENGINEER REGISTERED IN THE STATE IN WHICH THE PROJECT IS LOCATED SHOWING DESIGNS OF METAL STAIRS, METAL RAILINGS AND CONNECTIONS TO STRUCTURE TAKING INTO ACCOUNT THE VERTICAL AND LATERAL LOADS STATED IN THE GOVERNING CODES. WHERE HEADERS OR OTHER TYPES OF STRUCTURAL MEMBERS HAVE BEEN DESIGNATED ON THE STRUCTURAL CONTRACT DOCUMENTS TO SUPPORT THE STAIRS, THE CONNECTIONS FROM THE STAIRS SHALL BE DESIGNED SO THAT NO ECCENTRIC OR TORSIONAL FORCES ARE IMPOSED ON THESE STRUCTURAL MEMBERS. IF ECCENTRIC CONNECTIONS ARE USED, CONTRACTOR SHALL PROVIDE BRACING ELEMENTS FOR ALL SUPPORTING STEEL TO ELIMINATE THE TORSIONAL EFFECTS OF THE ECCENTRIC CONNECTIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING ALL EMBEDDED ITEMS AND HARDWARE AS REQUIRED PER THE STAIR DESIGN.
GC19. STRUCTURAL COMPONENTS ARE NOT DESIGNED FOR VIBRATING EQUIPMENT. MOUNT VIBRATING EQUIPMENT ON VIBRATION ISOLATORS, INERTIA PADS, ETC.

19. EXACT LOCATIONS OF ROOF PENETRATIONS TO BE COORDINATED BY THE GENERAL CONTRACTOR BETWEEN STEEL/JOIST/DECK/HVAC SUBCONTRACTORS. SEE DETAIL FOR ROOF FRAME REQUIREMENTS.

STRUCTURAL SPECIAL INSPECTIONS

1. THE QUALIFIED AGENCY RETAINED BY THE OWNER FOR THESE SPECIAL INSPECTION SERVICES SHALL BE APPROVED BY THE OWNER, THE ARCHITECT, AND THE ENGINEER OF RECORD PRIOR TO START OF CONSTRUCTION. AN OUTLINE OF THE SCOPE OF SERVICES TO BE PERFORMED BY THE INSPECTING AGENCY IS TO BE SUBMITTED PRIOR TO THE START OF CONSTRUCTION.

2. IN ACCORDANCE WITH SECTION 1705 OF THE INTERNATIONAL BUILDING CODE, AND ALL APPLICABLE STATE AND LOCAL REQUIREMENTS, AN INDEPENDENT APPROVED AGENCY SHALL MAKE PERIODIC AND/OR CONTINUOUS INSPECTIONS OF THE CONSTRUCTION PROGRESS IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS: [ENGINEER'S NOTE: DELETE ANY MATERIAL SECTION BELOW THAT DOES NOT APPLY TO YOUR SPECIFIC PROJECT]

STEEL CONSTRUCTION	SECTION 1705.2, TABLE 1705.2.3 & AISC 360
CONCRETE CONSTRUCTION	SECTION 1705.3, TABLE 1705.3
SOILS	SECTION 1705.6, TABLE 1705.6

FOUNDATIONS

1. PERFORM ALL SITE PREPARATION AND EXCAVATION WORK IN STRICT ACCORDANCE WITH THE GEOTECHNICAL INVESTIGATION REPORT PREPARED BY REMINGTON&VERNICK ENGINEERS (DATED DEC 14,2020).

2. EXCAVATE THE BUILDING SITE TO THE DEPTH AND EXTENT INDICATED IN THE SOILS REPORT. ALL SUBGRADES SHALL BE APPROVED IN WRITING BY THE SOILS ENGINEER PRIOR TO BACKFILLING.

3 BOTTOM OF FOOTINGS SHALL BEAR ON SUBGRADE CAPABLE OF SAFELY SUPPORTING 16000 PSF PER THE GEOTECHNICAL REPORT.

4. SUBGRADE OF ALL FOOTINGS MUST BE INSPECTED UNDER THE SUPERVISION OF AND APPROVED BY A REGISTERED SOILS ENGINEER BEFORE PLACING ANY CONCRETE. APPROVAL IN WRITING MUST INDICATE THE SOIL IS ADEQUATE TO SAFELY SUSTAIN SPECIFIED SOIL BEARING PRESSURE.

5. BOTTOM OF ALL EXTERIOR FOOTINGS SHALL BE A MINIMUM OF 3 FEET BELOW EXTERIOR FINISH GRADE. ALL FOOTING ELEVATIONS SHOWN ON PLAN ARE THE BEST APPROXIMATIONS BASED ON AVAILABLE DATA. GENERAL CONTRACTOR MAY ALTER FOOTING ELEVATIONS FOR REASONS INCLUDING, BUT NOT LIMITED TO, REVISED GEOTECHNICAL OR CIVIL INFORMATION, UNFORESEEN CONDITIONS, ACTUAL INVERT ELEVATIONS, CONSTRUCTABILITY, ETC. CONTRACTOR SHALL NOTIFY ARCHITECT AND OBTAIN WRITTEN APPROVAL PRIOR TO ANY MODIFICATIONS.

6. DO NOT BACKFILL ANY BASEMENT WALLS WITH AN UNBALANCED HEIGHT OF SOIL GREATER THAN THREE FEET UNTIL ELEVATED FLOOR IS IN-PLACE AND THE WALL HAS REACHED ITS DESIGN STRENGTH OR THE WALLS ARE ADEQUATELY BRACED.

7. EXPOSED CONCRETE/CMU WALLS SHALL HAVE CONTROL JOINTS AT 30 FEET MAXIMUM ON CENTER UNLESS NOTED OTHERWISE. WALLS WITH INTEGRAL COLUMN PIERS OR PILASTERS SHALL BE POURED MONOLITHICALLY AND SHALL HAVE A FORMED CONTROL JOINT ON ONE SIDE OF EACH PIER ON THE EXPOSED FACE OF THE WALL. JOINTS SHALL BE FILLED WITH AN APPROVED SEALANT.

CONCRETE

1. REINFORCING STEEL SHALL BE WITHIN TOLERANCES SET FORTH IN ACI 117, AND HAVE THE SPECIFIED CLEAR COVER, UNLESS NOTED OTHERWISE ON DRAWINGS:

CONCRETE POURED AGAINST EARTH		3"
CONCRETE EXPOSED TO EARTH OR WEATHER:		
#5 OR SMALLER		1 1/2"
#6 OR LARGER		2"
CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:		
COLUMNS (TIES AND MAIN REINFORCING)		1 1/2"
SLABS, WALLS, JOISTS:	#14 OR #18 BARS	1 1/2"
	#11 OR SMALLER	3/4"
BEAMS (STIRRUPS AND MAIN REINFORCING)		1 1/2"

CLEAR COVER SHALL BE CLEARLY SHOWN ON ALL REINFORCING BAR DETAIL DRAWINGS.

2. ALL CONCRETE SHALL BE READY-MIX AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF:

A. SPREAD FOOTINGS/WALL FOOTINGS/FOUNDATION WALL
BASEMENT WALLS/RETAINING WALLS 6,000 PSI
B. GRADE BEAMS/PILE CAPS/CAISSONS 6,000 PSI
C. PIERS-MATCH WALL STRENGTH 6,000 PSI
D. SLAB-ON-GRADE 4,000 PSI
E. BEAM AND COLUMN FRAMING 6,000 PSI
F. STRUCTURAL SLABS 6,000 PSI
G. OR AS SHOWN ON DRAWINGS.
H. HAVE A MINIMUM OF 500 LBS. OF CEMENT PER CUBIC YARD.
SLUMP (AT POINT OF CONCRETE PLACEMENT) SHALL BE 3 INCH MINIMUM AND 6 INCH MAXIMUM.
I. CONCRETE EXPOSED TO WEATHER SHALL HAVE 5 PERCENT AIR ENTRAINMENT. CONCRETE NOT EXPOSED TO WEATHER SHALL NOT CONTAIN AN AIR-ENTRAINING AGENT.
J. SUBMIT MIX DESIGNS FOR REVIEW.

NORMAL-WEIGHT CONCRETE TO BE GIVEN A HARD-TROWELED FINISH SHALL NOT CONTAIN AN AIR-ENTRAINING AGENT. TOTAL AIR CONTENT FOR THIS CONCRETE SHOULD NOT EXCEED 3 PERCENT (AT POINT OF CONCRETE PLACEMENT). ALL CONCRETE WORK SHALL COMPLY WITH THE REQUIREMENTS OF

K. ACI 318-14 PER NJ IBC 2018 CHAPTER 35

THE ACI DETAILING MANUAL (ACI 315), AND THE SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS (ACI 301).

3. ALL REINFORCING STEEL SHALL BE MANUFACTURED FROM HIGH STRENGTH BILLET STEEL CONFORMING TO ASTM DESIGNATION A615-04A GRADE 60. EXCEPT #14 BARS AND LARGER WHICH SHALL CONFORM TO ASTM A615 GRADE 75. WWR SHALL COMPLY WITH ASTM A185.

4. DEVELOPMENT LENGTHS, NOTED AS L_d ON DRAWINGS, AND SPLICE/LAP LENGTHS OF ALL REINFORCING STEEL TO BE PER DETAIL WITH NOTES ENTITLED "TABLE OF DEVELOPMENT AND LAP SPLICE LENGTH". LAP SPLICES OF #14 BARS AND LARGER ARE NOT PERMITTED. THESE BARS MUST BE MECHANICALLY COUPLED WITH DEVICES RATED TO DEVELOP 125% OF Fy OF THE BAR. SUBMIT PRODUCT DATA FOR ENGINEERING APPROVAL. [ENGINEER NOTE: YOU MUST INCLUDE THIS NOTE ON ALL PROJECTS WITH REINFORCED CONCRETE. YOU MUST INCLUDE THE TYPICAL DETAIL FRM/CP0 – AND MOST LIKELY FRM/CP0A - FOR ALL PROJECTS WITH CONCRETE REINFORCING].

5. ALL INSERTS AND SLEEVES SHALL BE CAST-IN-PLACE. THE CONTRACTOR SHALL VERIFY THE DIMENSIONS AND LOCATIONS OF ALL OPENINGS, PIPE SLEEVES, ETC. AS REQUIRED BY ALL TRADES BEFORE THE CONCRETE IS POURED. THE CONTRACTOR SHALL CONSULT THE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS, AS WELL AS THE STRUCTURAL DRAWINGS FOR THE LOCATION, NUMBER, AND SIZE OF ALL OPENINGS, SLEEVES, ETC. HOWEVER, OPENINGS NOT SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE INSTALLED ONLY AFTER APPROVAL BY THE STRUCTURAL ENGINEER IS OBTAINED. DRAWINGS SHALL BE SUBMITTED FOR REVIEW SHOWING LOCATIONS AND DIMENSIONS OF ALL OPENINGS, SLEEVES, ETC. IN CAST-IN-PLACE CONCRETE SLABS, BEAMS, WALLS, COLUMNS, AND FOUNDATIONS. THESE DRAWINGS SHALL BE COORDINATED BY THE CONTRACTOR. OPENINGS AND SLEEVES THROUGH CAST-IN-PLACE CONCRETE FRAMING IS PROHIBITED EXCEPT WHERE THOSE SLEEVES AND OPENINGS ARE SHOWN ON THE STRUCTURAL DRAWINGS OR WHERE THEY ARE SHOWN ON THE APPROVED SLEEVE AND OPENING DRAWINGS THAT HAVE BEEN SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW. SAW-CUTTING, CORING, OR DRILLING OF SLEEVES OR OPENING THROUGH PREVIOUSLY CAST CONCRETE IS NOT PERMITTED EXCEPT WHERE SPECIFICALLY REVIEWED AND APPROVED BY THE STRUCTURAL ENGINEER.

6. FOR GRADE BEAMS LAP ALL TOP STEEL AT MID-SPAN AND LAP BOTTOM STEEL OVER SUPPORT.

7. LOCATION OF CONSTRUCTION JOINTS IN THE STRUCTURAL SLAB SHALL BE SUBMITTED FOR APPROVAL BY THE STRUCTURAL ENGINEER. CONSTRUCTION JOINTS IN STRUCTURAL SLABS AND GRADE BEAMS SHALL BE AT MID-SPAN AND KEY JOINTED WITH REINFORCING CONTINUOUS ACROSS JOINT. CONSTRUCTION JOINTS IN SLABS ON METAL DECK SHALL OCCUR MIDWAY BETWEEN BEAMS AT END THIRD OF GIRDER SPAN.

8. LIGHTWEIGHT CONCRETE SHALL BE USED FOR FRAMED FLOORS AS NOTED ON THE DRAWINGS. TOTAL AIR CONTENT AT POINT OF CONCRETE PLACEMENT SHALL BE LIMITED TO 5.5 PERCENT (PLUS OR MINUS 1.5 PERCENT) FOR HARD TROWELED FINISHED AREAS. THIS CONCRETE IS TO HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,500 PSI AND AN IN-PLACE DRY DENSITY OF 107 - 113 POUNDS PER CUBIC FOOT OR PER THE REQUIREMENTS SET FORTH IN THE FIRE RATING SPECIFICATIONS.

9. SUBMIT ALL REINFORCING SHOP DRAWINGS FOR REVIEW PRIOR TO ANY FABRICATION.

10. FOR CONCRETE SLABS ON METAL DECK, FLOORS SHALL BE POURED TO THE THICKNESS SHOWN ON DOCUMENTS, NOT TO A LEVEL LINE.

11. THE CONTRACTOR SHALL INSTALL FLOOR LEVELING MATERIAL AND PERFORM OTHER CORRECTIVE MEASURES IN ALL AREAS, INCLUDING BUT NOT LIMITED TO, AREAS WHERE FLOOR FINISH PROVISIONS DO NOT COMPLY WITH THE FLATNESS AND LEVELNESS REQUIREMENTS. NOTE: UNLESS NOTED OTHERWISE, THE CALCULATED CENTER OF BAY DEFLECTION DUE TO DEAD LOADS ONLY, MEASURED ON A DIAGONAL DIMENSION BETWEEN COLUMNS, IS APPROXIMATELY N1" PER 10'-0" LENGTH.

12. CONTRACTOR TO ENGAGE AN ENGINEER, REGISTERED IN THE PROJECT'S JURISDICTION, TO DEVELOP ALL FORMWORK, SHORING, AND RESHORING DESIGNS AND PROCEDURES AND SUBMIT SIGNED AND SEALED DRAWINGS AND CALCULATIONS. ALL SHORING AND RESHORING MUST REMAIN IN PLACE FOR A MINIMUM OF 28 DAYS AFTER CONCRETE PLACEMENT, OR WHEN FULL STRENGTH IS ACHIEVED FROM FIELD CURED CYLINDERS

13. THE CONTRACTOR SHALL DELIVER TO THE ENGINEER, AT THE END OF THE JOB, ONE (1) ELECTRONIC VERSION OF THE FINAL FIELD COPIES OF ALL STEEL REINFORCING SHOP DRAWINGS.

14. RIGID INSULATION USED AS FLOOR FILL SHALL BE STYROFOAM HIGHLOAD 40 EXTRUDED POLYSTYRENE INSULATION (40 PSI COMPRESSIVE STRENGTH) ASTM C578, TYPE VI MANUFACTURED BY DOW CHEMICAL COMPANY, OR APPROVED EQUAL.

15. RIGID INSULATION USED AS FILL FOR GARAGE AREAS SHALL BE STYROFOAM BRAND PLAZAMATE EXTRUDED POLYSTRENE INSULATION (60 PSI COMPRESSIVE STRENGTH) ASTM C578, TYPE VII MANUFACTURED BY DOW CHEMICAL COMPANY OR APPROVED EQUAL.

PRECAST CONCRETE

1. THE DESIGN, FABRICATION AND ERECTION OF PRECAST CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF ACI 318 AND THE LATEST PCI CODE. PRECAST MANUFACTURER SHALL BE PCI APPROVED. PRECAST MANUFACTURER SHALL SUBMIT DRAWINGS AND CALCULATIONS, BOTH OF WHICH MUST BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.

2. A. PRECAST CONCRETE PLANK
B. PRECAST TWIN TEES
C. PRECAST BEAMS/COLUMN/WALLS

SHALL BE DESIGNED TO SUPPORT ALL SUPERIMPOSED LOADS INCLUDING PARTITION LOADS. FOR LOCATION OF PARTITIONS, SEE ARCHITECTURAL DRAWINGS.

3. IF SHIMS ARE REQUIRED AT PRECAST PLANK BEARING, THEY MUST BE CONTINUOUS FOR THE FULL WIDTH OF THE PLANK. POINT SHIMMING IS NOT ACCEPTABLE. USE KORALATH SHIMS OR APPROVED EQUAL.

4. PRECAST CONCRETE MEMBERS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.

5. PRECAST MANUFACTURER SHALL COORDINATE WITH OTHER TRADES AND ALL CONTRACT DRAWINGS FOR SIZE AND LOCATION OF ALL OPENINGS. PRECAST MANUFACTURER SHALL DESIGN, PROVIDE, AND INSTALL ALL HANGERS, INSERTS, ATTACHMENTS AND APPURTENANCES AS REQUIRED.

6. ALL OPENINGS IN PRECAST CONCRETE MUST BE PROVIDED BY OR APPROVED IN WRITING BY PRECAST MANUFACTURER. NO REINFORCING IN PRECAST CONCRETE IS TO BE CUT WITHOUT PRIOR APPROVAL OF PRECAST MANUFACTURER. ANY OPENINGS SHOWN ON STRUCTURAL DRAWINGS ARE FOR ILLUSTRATIVE PURPOSES ONLY. QUANTITIES, SIZES AND LOCATIONS OF ALL PROPOSED CORES/OPENINGS, INCLUDING BUT NOT LIMITED TO OPENINGS FOR SHAFTS AND PIPES, ARE TO BE OBTAINED FROM OTHER DOCUMENTS.

7. PRECAST MANUFACTURER IS TO OBTAIN ALL ARCHITECTURAL PRECAST CONCRETE DIMENSIONS FROM ARCHITECTURAL DOCUMENTS.

8. PRECAST MANUFACTURER TO COORDINATE QUANTITIES AND LOCATIONS OF ALL CONNECTIONS (GRAVITY AND LATERAL) FOR ARCHITECTURAL PRECAST CONCRETE WITH MANUFACTURER OF SUPPORT MATERIAL (STEEL, CONCRETE, ETC.), BASED ON GENERAL GUIDELINES AS SHOWN ON STRUCTURAL DOCUMENTS.

9. WELD PLATES AND OTHER EMBEDDED ITEMS AS SHOWN ON STRUCTURAL DRAWINGS ARE FOR DESIGN INTENT ONLY. PRECAST MANUFACTURER IS RESPONSIBLE FOR QUANTITY AND LOCATION OF THEIR ITEMS.

10. THE CONTRACTOR SHALL DELIVER TO THE ENGINEER, AT THE END OF THE JOB, ONE (1) ELECTRONIC VERSION OF THE FINAL FIELD COPIES OF ALL PRECAST CONCRETE SHOP DRAWINGS.

DESIGN LOAD SCHEDULE
(ALL LOADS SHOWN ARE IN POUNDS PER SQ. FT.)

COMPONENT \ AREA	SLAB ON GRADE	ROOF	TYPICAL FLOOR			
CONCRETE SLAB	63	X				
PRECAST FRAMING		*	*			
COLLATERAL		5	5			
TOTAL DEAD LOAD	63	*	*			
TOTAL LIVE LOAD	100	40	40			
TOTAL LOAD	163	*	*			

"*" INDICATES LOADS TO BE DETERMINED BY PRECAST MANUFACTURER

SNOW DESIGN LOAD SCHEDULE
INTERNATIONAL BUILDING CODE 2018/ASCE 7-16

ITEM	SYMBOL	VALUE	REFERENCE
GROUND SNOW LOAD	P_g	25	FIGURE 1608.2
SNOW EXPOSURE FACTOR	C_e	1.0	TABLE 7.3-1
SNOW LOAD IMPORTANCE FACTOR	I_s	1.0	TABLE 1.5-2
THERMAL FACTOR	C_t	1.0	TABLE 7.3-2
FLAT-ROOF SNOW LOAD	P_f	20	SECTION 7.3

LATERAL LOAD DESIGN SCHEDULE
INTERNATIONAL BUILDING CODE 2018/ASCE 7-16

WIND LOAD

ITEM	SYMBOL	VALUE	REFERENCE
BASIC WIND SPEED (3 SEC. GUST)	V	114	FIGURE 1609.3
RISK CATEGORY	-	II	TABLE 1.5-1
WIND EXPOSURE CATEGORY	-	B	SECTION 1609.4.3

SEISMIC LOAD

ITEM	SYMBOL	VALUE	REFERENCE
IMPORTANCE FACTOR	I_E	1.0	TABLE 1.5-2
SHORT PERIOD SPECTRAL ACCELERATION	S_{DS}	0.245	SECTION 1613.2.4
(1) SECOND PERIOD SPECTRAL ACCELERATION	S_{D1}	0.059	SECTION 1613.2.4
RISK CATEGORY	-	II	TABLE 1604.5
SEISMIC DESIGN CATEGORY	-	B	SECTION 11.6
SITE CLASSIFICATION	-	C	TABLE 20.3-1
SEISMIC FORCE-RESISTING SYSTEM	-	INTERMEDIATE P/C CONCRETE SHEAR WALL	TABLE 12.2-1
RESPONSE MODIFICATION COEFFICIENT	R	4	TABLE 12.2-1
DEFLECTION AMPLIFICATION FACTOR	C_d	4	TABLE 12.2-1
SEISMIC BASE SHEAR	V	-	SECTION 12.8.1
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE		SECTION 12.8

TYPICAL ABBREVIATIONS

A.B.	ANCHOR BOLT	L.P.	LOW POINT
A.F.F.	ABOVE FINISH FLOOR	L.W.	LIGHT WEIGHT
ADDL.	ADDITIONAL	LLH	LONG LEG HORIZONTAL
ALT.	ALTERNATE	LLV	LONG LEG VERTICAL
ARCH.	ARCHITECT	LWB	LONG WAY BOTTOM
B.C.E.	BOTTOM CHORD EXTENSION	M.E.P.	MECHANICAL ELECTRICAL PLUMBING
B.O.	BOTTOM OF	M.S.T.	METAL STUD TRUSS
BLDG.	BUILDING	MAX.	MAXIMUM
BM.	BEAM	MECH.	MECHANICAL
BOTT.	BOTTOM	MEZZ.	MEZZANINE
BRG.	BEARING	MFR.	MANUFACTURER
BSMT.	BASEMENT	MIN.	MINIMUM
BP_	BEARING PLATE	MISC.	MISCELLANEOUS
BTWN.	BETWEEN	MP_	MASONRY PIER
℄	CENTERLINE	NBL	NON BEARING LINTEL
CANT.	CANTILEVER	N.T.S.	NOT TO SCALE
CMU	CONCRETE MASONRY UNIT	N.W.	NORMAL WEIGHT
COL.	COLUMN	o/c	ON CENTER
CONC.	CONCRETE	P.A.F.	POWDER ACTUATED FASTENER
CONN.	CONNECTION	ℙ	PLATE
CONT.	CONTINUOUS	PC	PILE CAP
CTRD.	CENTERED	P/C	PRECAST
ϕ	DIAMETER	PSF	POUNDS PER SQUARE FOOT
DWG.	DRAWING	PSI	POUNDS PER SQUARE INCH
E.F.	EACH FACE	PTN.	PARTITION
E.O.D.	EDGE OF DECK	REINF.	REINFORCEMENT
E.O.S.	EDGE OF SLAB	REQ'D.	REQUIRED
E.W.	EACH WAY	RET'G.	RETAINING
EA.	EACH	S.F.	STEP FOOTING
EL.	ELEVATION	S.O.G.	SLAB ON GRADE
ELEV.	ELEVATOR	SCHED.	SCHEDULE
EMBED.	EMBEDMENT	SECT.	SECTION
EQ.	EQUAL	SIM.	SIMILAR
EQUIP.	EQUIPMENT	SPECS.	SPECIFICATIONS
EWB	EACH WAY BOTTOM	STIFF.	STIFFENER
EWT	EACH WAY TOP	STRUCT.	STRUCTURAL
EX.	EXISTING	SWB	SHORT WAY BOTTOM
EXIST.	EXISTING	T&B	TOP AND BOTTOM
EXP.	EXPANSION	T.	TOP
EXT.	EXTERIOR	T.O.	TOP OF
FDN.	FOUNDATION	T.O.C.	TOP OF CONCRETE
FIN.	FINISH	T.O.S.	TOP OF STEEL
FLR.	FLOOR	T.S.	THICKENED SLAB
FT.	FEET	TCELE	TOP CHORD EXTENSION LEFT END
FTG.	FOOTING	TCERE	TOP CHORD EXTENSION RIGHT END
GA.	GAGE	TDS	TURN DOWN SLAB
GALV.	GALVANIZED	THK.	THICK OR THICKENED
GB_	GRADE BEAM	TYP.	TYPICAL
H.P.	HIGH POINT	U.N.O.	UNLESS NOTED OTHERWISE
HORIZ.	HORIZONTAL	V.I.F.	VERIFY IN FIELD
I.F.	INSIDE FACE	VERT.	VERTICAL
IN.	INCHES	W.R.T.	WOOD ROOF TRUSS
INFO.	INFORMATION	w/	WITH
INT.	INTERIOR	WC	WET COLUMN
JT.	JOINT	WP	WALL PLATE
k	KIP	WWF	WELDED WIRE FABRIC
k-ft	KIP-FEET		

COLUMN FOOTING SCHEDULE (16,000 psf SOIL BRG. PRESSURE)

MARK	DIMENSIONS LENGTH	WIDTH	THICKNESS	REINFORCING
F50	5'-0"	5'-0"	3'-0"	(7) #7 EWB
F60	6'-0"	6'-0"	1'-4"	(7) #5 EWB
F60	6'-0"	6'-0"	3'-0"	(8) #7 EWB
F76	7'-6"	7'-6"	3'-0"	(8) #8 EWB
F80	8'-0"	8'-0"	3'-0"	(9) #8 EWB
F9080	8'-0"	9'-0"	4'-6"	(14) #8 SWB; (12) #8 LWB
F12090	9'-0"	12'-0"	3'-6"	(14) #9 SWB; (14) #9 LWB
F14070	7'-0"	14'-0"	4'-0"	(15) #9 SWB; (13) #9 LWB
F14090	9'-0"	14'-0"	4'-0"	(16) #9 SWB; (16) #9 LWB
F15080	8'-0"	15'-0"	4'-6"	(14) #10 SWB; (14) #10 LWB
F16090	9'-0"	16'-0"	4'-6"	(16) #10 SWB; (16) #10 LWB
F17086	8'-6"	17'-0"	4'-6"	(16) #10 EWB

PIER SCHEDULE

MARK	SIZE	REINFORCING
MP1016	12" x 16" CMU	
MP1024	8" x 24" CMU	
P24	24" x 24" CONC.	(8) #10 VERT. w/ #4 TIES @ 12"
P30	30" x 30" CONC.	(12) #10 VERT. w/ #4 TIES @ 12"
P2432	24" x 32" CONC.	(10) #10 VERT. w/ #4 TIES @ 12"
P3036	30" x 36" CONC.	(14) #10 VERT. w/ #4 TIES @ 12"
P3042	30" x 42" CONC.	(16) #10 VERT. w/ #4 TIES @ 12"
P3642	36" x 42" CONC.	(18) #10 VERT. w/ #4 TIES @ 12"
P4242	42" x 42" CONC.	(20) #10 VERT. w/ #4 TIES @ 12"

WALL FOOTING SCHEDULE

MARK	DIMENSIONS WIDTH	DEPTH	REINFORCING
F26.30	2'-6"	3'-0"	(4) #7 LWB. #7 @ 9" SWB
F7030	7'-0"	3'-0"	#7 @12" LW T&B; #9 @12" SW T&B
F71048	7'-10"	4'-0"	SEE SECTION

GRADE BEAM SCHEDULE

MARK	WIDTH	DEPTH	TOP BARS	BOTT. BARS	MID BARS EA. FACE	STIRRUP SIZE & SPACING	REMARKS
GB1	2'-0"	3'-0"	(4) #9	(8) #9	(2) #5 @ 12" E.F.	#4 @ 12"	REINF. CONT. THRU PIER
GB2	2'-0"	4'-0"	(6) #10	(10) #10	(2) #5 @ 12" E.F.	#4 @ 10"	REINF. CONT. THRU PIER
GB3	4'-0"	5'-6"	(14) #10	(8) #10	(4) #5 E.F.	(8) #5, SPACING PER REMARKS	1. PROVIDE TOP BARS IN (2) LAYERS, 2. PROVIDE 5" SPACING FOR BEAM END AT GRID-7 (20'-0" MIN.) & 12" SPACING @ BALANCE
GB4	5'-0"	7'-0"	(16) #10	(8) #10	(5) #5 E.F.	(8) #5, SPACING PER REMARKS	1. PROVIDE TOP BARS IN (2) LAYERS, 2. PROVIDE 5" SPACING FOR BEAM END AT GRID-7 (20'-0" MIN.) & 12" SPACING @ BALANCE
GB5	5'-0"	9'-0"	(16) #10	(8) #10	(8) #5 E.F.	(8) #5, SPACING PER REMARKS	1. PROVIDE TOP BARS IN (2) LAYERS, 2. PROVIDE 5" SPACING FOR BEAM END AT GRID-7 (20'-0" MIN.) & 12" SPACING @ BALANCE
GB6	8'-0"	4'-3"	(24) #10	(12) #10	(3) #5 E.F.	(12) #5, SPACING PER REMARKS	1. REINF. CONT. THRU FOOTING. PROVIDE TOP BARS IN (2) LAYERS, 2. PROVIDE 5" SPACING FOR BEAM END AT GRID-7 (20'-0" MIN.) & 12" SPACING @ BALANCE

ISSUED FOR BIDDING
7/28/2021

O'DONNELL& NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:
GENERAL NOTES & SCHEDULES

PROJECT TITLE:
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.
S-200

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION - TABLE 1705.3

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD [a]	IBC REFERENCE
1. INSPECT REINFORCEMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT.	–	X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1–26.6.3	1908.4
2. REINFORCING BAR WELDING: a. VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A706; b. INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM 5/16"; AND c. INSPECT ALL OTHER WELDS.	– X	X X	AWS D1.4 ACI 318: 26.6.4	–
3. INSPECT ANCHORS CAST IN CONCRETE.	–	X	ACI 318:17.8.2	–
4. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS. [b] a. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS. b. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.a.	X –	 X	 ACI 318: 17.8.2.4 ACI 318: 17.8.2	 – –
5. VERIFY USE OF REQUIRED DESIGN MIX	–	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	–	ASTM C172 ASTM C31 ACI 318: 26.5, 26.12	1908.10
7. INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	–	ACI 318: 26.5	1908.6, 1908.7, 1908.8
8. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	–	X	ACI 318: 26.5.3–26.5.5	1908.9
9. INSPECT PRESTRESSED CONCRETE FOR: a. APPLICATION OF PRESTRESSING FORCES; AND b. GROUTING OF BONDED PRESTRESSING TENDONS.	X X	– –	ACI 318: 26.10	–
10. INSPECT ERECTION OF PRECAST CONCRETE MEMBERS.	–	X	ACI 318: Ch. 26.9	–
11. VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	–	X	ACI 318: 26.11.2	–
12. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	–	X	ACI 318: 26.11.2(b)	–

a - WHERE APPLICABLE, SEE SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE.

b - SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR THE ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2 IN ACI 318, OR OTHER QUALIFICATION PROCEDURES. WHERE SPECIFIC REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS - TABLE 1705.6

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	–	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	–	X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	–	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	–
5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	–	X

INSPECTION TASKS PRIOR TO WELDING - TABLE N5.4-1

INSPECTION TASKS PRIOR TO WELDING	QC	QA
WELDER QUALIFICATION RECORDS AND CONTINUITY RECORDS	P	O
WPS AVAILABLE	P	P
MANUFACTURER CERTIFICATIONS FOR WELDING CONSUMABLES AVAILABLE	P	P
MATERIAL IDENTIFICATION (TYPE/GRADE)	O	O
WELDER IDENTIFICATION SYSTEM [a]	O	O
FIT-UP OF GROOVE WELDS (INCLUDE JOINT GEOMETRY) • JOINT PREPARATIONS • DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL) • CLEANLINESS (CONDITION OF STEEL SURFACES) • TACKING (TACK WELD QUALITY & LOCATION) • BACKING TYPE AND FIT (IF APPLICABLE)	O	O
FIT-UP OF CJP GROOVE WELDS OF HSS T-, Y- AND K-JOINTS WITHOUT BACKING (INCLUDING JOINT GEOMETRY) • JOINT PREPARATIONS • DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL) • CLEANLINESS (CONDITION OF STEEL SURFACES) • TACKING (TACK WELD QUALITY & LOCATION)	P	O
CONFIGURATION AND FINISH OF ACCESS HOLES	O	O
FIT-UP OF FILLET WELDS • DIMENSIONS (ALIGNMENT, GAPS AT ROOT) • CLEANLINESS (CONDITION OF STEEL SURFACES) • TACKING (TACK WELD QUALITY & LOCATION)	O	O
CHECK WELDING EQUIPMENT	O	-

a - THE FABRICATOR OR ERECTOR, AS APPLICABLE, SHALL MAINTAIN A SYSTEM BY WHICH A WELDER WHO HAS WELDED A JOINT OR MEMBER CAN BE IDENTIFIED. STAMPS, IF USED, SHALL BE THE LOW-STRESS TYPE.

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH WELDED JOINT OR MEMBER.

INSPECTION TASKS DURING WELDING - TABLE N5.4-2

INSPECTION TASKS DURING WELDING	QC	QA
CONTROL AND HANDLING OF WELDING CONSUMABLES • PACKAGING • EXPOSURE CONTROL	O	O
NO WELDING OVER CRACKED TACK WELDS	O	O
ENVIRONMENTAL CONDITIONS • WIND SPEED WITHIN LIMITS • PRECIPITATION AND TEMPERATURE	O	O
WPS FOLLOWED • SETTINGS ON WELDING EQUIPMENT • TRAVEL SPEED • SELECTED WELDING MATERIALS • SHIELDING GAS TYPE/FLOW RATE • PREHEAT APPLIED • INTERPASS TEMPERATURE MAINTAINED (MIN./MAX.) • PROPER POSITION (F, V, H, OH)	O	O
WELDING TECHNIQUES • INTERPASS AND FINAL CLEANING • EACH PASS WITHIN PROFILE LIMITATIONS • EACH PASS MEETS QUALITY REQUIREMENTS	O	O
PLACEMENT AND INSTALLATION OF STEEL HEADED STUD ANCHORS	P	P

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH WELDED JOINT OR MEMBER.

REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS - TABLE 1705.2.3

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD [a]
1. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS			
a. END CONNECTIONS - WELDING OR BOLTED	–	X	SJI SPECIFICATIONS LISTED IN SECTION 2207.1.
b. BRIDGING - HORIZONTAL OR DIAGONAL.	–	–	–
1. STANDARD BRIDGING.	–	X	SJI SPECIFICATIONS LISTED IN SECTION 2207.1.
2. BRIDGING THAT DIFFERS FROM THE SJI SPECIFICATIONS LISTED IN SECTION 2207.1.	–	X	–

a - WHERE APPLICABLE, SEE SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE.

INSPECTION TASKS AFTER WELDING - TABLE N5.4-3

INSPECTION TASKS AFTER WELDING	QC	QA
WELDS CLEANED	O	O
SIZE, LENGTH AND LOCATION OF WELDS	P	P
WELDS MEET VISUAL ACCEPTANCE CRITERIA • CRACK PROHIBITION • WELD/BASE-METAL FUSION • CRATER CROSS SECTION • WELD PROFILES • WELD SIZE • UNDERCUT • POROSITY	P	P
ARC STRIKES	P	P
k-AREA [a]	P	P
WELD ACCESS HOLES IN ROLLED HEAVY SHAPES AND BUILT-UP HEAVY SHAPES [b]	P	P
BACKING REMOVED AND WELD TABS REMOVED (IF REQUIRED)	P	P
REPAIR ACTIVITIES	P	P
DOCUMENT ACCEPTANCE OR REJECTION OF WELDED JOINT OR MEMBER	P	P
NO PROHIBITED WELDS HAVE BEEN ADDED WITHOUT THE APPROVAL OF THE EOR.	O	O

a - WHEN WELDING OF DOUBLER PLATES, CONTINUITY PLATES OR STIFFENERS HAS BEEN PERFORMED IN THE k-AREA, VISUALLY INSPECT THE WEB k-AREA FOR CRACKS WITHIN 3 IN. (75 mm) OF THE WELD.

b - AFTER ROLLED HEAVY SHAPES (SEE SECTION A3.1c) AND BUILT-UP HEAVY SHAPES (SEE SECTION A3.1d) ARE WELDED, VISUALLY INSPECT THE WELD ACCESS HOLES FOR CRACKS.

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH WELDED JOINT OR MEMBER.

INSPECTION TASKS PRIOR TO BOLTING - TABLE N5.6-1

INSPECTION TASKS PRIOR TO BOLTING	QC	QA
MANUFACTURER'S CERTIFICATIONS AVAILABLE FOR FASTENER MATERIALS	O	P
FASTENERS MARKED IN ACCORDANCE WITH ASTM REQUIREMENTS	O	O
CORRECT FASTENERS SELECTED FOR THE JOINT DETAIL (GRADE, TYPE, BOLT LENGTH IF THREADS ARE TO BE EXCLUDED FROM THE SHEAR PLANE)	O	O
CORRECT BOLTING PROCEDURE SELECTED FOR JOINT DETAIL	O	O
CONNECTING ELEMENTS, INCLUDING THE APPROPRIATE FAYING SURFACE CONDITION AND HOLE PREPARATION, IF SPECIFIED, MEET APPLICABLE REQUIREMENTS	O	O
PRE-INSTALLATION VERIFICATION TESTING BY INSTALLATION PERSONNEL OBSERVED AND DOCUMENTED FOR FASTENER ASSEMBLIES AND METHODS USED	P	O
PROPER STORAGE PROVIDED FOR BOLTS, NUTS, WASHERS AND OTHER FASTENER COMPONENTS	O	O

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION.

INSPECTION TASKS DURING BOLTING - TABLE N5.6-2

INSPECTION TASKS DURING BOLTING	QC	QA
FASTENER ASSEMBLIES PLACED IN ALL HOLES AND WASHERS AND NUTS ARE POSITIONED AS REQUIRED.	O	O
JOINT BROUGHT TO THE SNUG-TIGHT CONDITION PRIOR TO THE PRETENSIONING OPERATION	O	O
FASTENER COMPONENT NOT TURNED BY THE WRENCH PREVENTED FROM ROTATING	O	O
FASTENERS ARE PRETENSIONED IN ACCORDANCE WITH THE RCSC SPECIFICATION, PROGRESSING SYSTEMATICALLY FROM THE MOST RIGID POINT TOWARD THE FREE EDGES	O	O

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION.

INSPECTION TASKS AFTER BOLTING - TABLE N5.6-3

INSPECTION TASKS AFTER BOLTING	QC	QA
DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	P	P

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.

P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

SPECIAL INSPECTIONS 1

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.
S-201

INSPECTION OR EXECUTION TASKS AFTER WELDING - ANSI/SDI TABLE 1.5

TASK	QC	QA
VERIFY SIZE AND LOCATION OF WELDS, INCLUDING SUPPORT, SIDELAP, AND PERIMETER WELDS.	P	P
WELDS MEET VISUAL ACCEPTANCE CRITERIA.	P	P
VERIFY REPAIR ACTIVIES.	P	P
DOCUMENT ACCEPTANCE OR REJECTION OF WELDS.	P	P

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS PRIOR TO MECHANICAL FASTENING - ANSI/SDI TABLE 1.6

TASK	QC	QA
MANUFACTURER INSTALLATION INSTRUCTIONS AVAILABLE FOR MECHANICAL FASTENERS.	O	O
PROPER TOOLS AVAILABLE FOR FASTENER INSTALLATION.	O	O
PROPER STORAGE FOR MECHANICAL FASTENERS.	O	O

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS DURING MECHANICAL FASTENING - ANSI/SDI TABLE 1.7

TASK	QC	QA
FASTENERS ARE POSITIONED AS REQUIRED.	O	O
FASTENERS ARE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.	O	O

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS AFTER MECHANICAL FASTENING - ANSI/SDI TABLE 1.8

TASK	QC	QA
CHECK SPACING, TYPE, AND INSTALLATION OF SUPPORT FASTENERS.	P	P
CHECK SPACING, TYPE, AND INSTALLATION OF SIDELAP FASTENERS.	P	P
CHECK SPACING, TYPE, AND INSTALLATION OF PERIMETER FASTENERS.	P	P
VERIFY REPAIR ACTIVITIES.	P	P
DOCUMENT ACCEPTANCE OR REJECTION OF MECHANICAL FASTENERS.	P	P

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS PRIOR TO DECK PLACEMENT - ANSI/SDI TABLE 1.1

TASK	QC	QA
VERIFY COMPLIANCE OF MATERIALS (DESK AND AND ALL DECK ACCESSORIES) WITH CONSTRUCTION DOCUMENTS, INCLUDING PROFILES, MATERIAL PROPERTIES, AND BASE METAL THICKNESS.	P	P
DOCUMENT ACCEPTANCE OR REJECTION OF DECK AND DECK ACCESSORIES	P	P

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS AFTER DECK PLACEMENT - ANSI/SDI TABLE 1.2

TASK	QC	QA
VERIFY COMPLIANCE OF DECK AND ALL DECK ACCESSORIES INSTALLATION WITH CONSTRUCTION DOCUMENTS.	P	P
VERIFY ALL DECK MATERIALS ARE REPRESENTED BY THE MILL CERTIFICATIONS THAT COMPLY WITH THE CONSTRUCTION DOCUMENTS.	-	P
DOCUMENT ACCEPTANCE OR REJECTION OF INSTALLATION OF DECK AND DECK ACCESSORIES.	P	P

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS PRIOR TO WELDING - ANSI/SDI TABLE 1.3

TASK	QC	QA
WELDING PROCEDURE SPECIFICATIONS (WPS) AVAILABLE.	O	O
MANUFACTURER CERTIFICATIONS FOR WELDING CONSUMABLES AVAILABLE.	O	O
MATERIAL IDENTIFICATION (TYPE/GRADE).	O	O
CHECK WELDING EQUIPMENT.	O	O

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

INSPECTION OR EXECUTION TASKS DURING WELDING - ANSI/SDI TABLE 1.4

TASK	QC	QA
USE OF QUALIFIED WELDERS.	O	O
CONTROL AND HANDLING OF WELDING CONSUMABLES.	O	O
ENVIORNMENTAL CONDITIONS (WIND SPEED, MOISTURE, TEMPERATURE).	O	O
WPS FOLLOWED.	O	O

O - INSPECT THESE ITEMS ON AN INTERMITTENT BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS. FREQUENCY OF OBSERVATIONS SHALL BE ADEQUATE TO CONFIRM THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE APPLICABLE DOCUMENTS.
P - PERFORM THESE TASKS PRIOR TO FINAL ACCEPTANCE FOR EACH ITEM OR ELEMENT.

SPECIAL INSPECTION REQUIREMENTS - IBC 2018 EDITION

1. THE QUALIFIED AGENCY AND PERSONNEL RETAINED FOR THESE SPECIAL INSPECTION SERVICES SHALL BE APPROVED BY THE OWNER, THE ARCHITECT AND THE ENGINEER OF RECORD PRIOR TO START OF CONSTRUCTION. AN OUTLINE OF THE SCOPE OF SERVICES TO BE PERFORMED BY THE INSPECTING AGENCY IS TO BE SUBMITTED PRIOR TO START OF CONSTRUCTION.

2. IN ACCORDANCE WITH SECTION 1705 OF THE INTERNATIONAL BUILDING CODE 2018 EDITION, WITH LOCAL AMMENDMENTS PER xxxxxx, PERIODIC AND/OR CONTINUOUS INSPECTIONS OF THE CONSTRUCTION PROGRESS SHALL BE MADE BY AN INDEPENDENT APPROVED AGENCY IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS;

STEEL CONSTRUCTION	SECTION 1705.2, TABLE1705.2.3
CONCRETE CONSTRUCTION	SECTION 1705.3, TABLE 1705.3
SOILS	SECTION 1705.6, TABLE 1705.6

STRUCTURAL OBSERVATIONS

1. STRUCTURAL OBSERVATIONS SHALL BE PROVIDED BY A REGISTERED DESIGN PROFESSIONAL OTHER THAN THE ENGINEER OF RECORD. THE DESIGNATED PROFESSIONAL SHALL PERFORM VISUAL OBSERVATIONS OF THE STRUCTURAL SYSTEM AT SIGNIFICANT CONSTRUCTION STAGES AND AT THE COMPLETION OF THE STRUCTURAL SYSTEM FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS. ANY OBSERVED DEFICIENCIES SHALL BE REPORTED IN WRITING TO THE OWNER, THE CODE ENFORCEMENT OFFICIAL, THE ARCHITECT AND THE ENGINEER OF RECORD.

2. AT THE CONCLUSION OF THE WORK, THE DESIGNATED PROFESSIONAL SHALL SUBMIT A WRITTEN STATEMENT TO THE CODE ENFORCEMENT OFFICIAL, INDICATING THAT THE BUILDING WAS CONSTRUCTED IN CONFORMITY WITH THE PLANS FILED WITH THE BUILDING DEPARTMENT, ALL NECESSARY SITE VISITS HAVE BEEN MADE AND THAT ANY REPORTED DEFICIENCIES HAVE BEEN RESOLVED TO THE BEST OF HIS KNOWLEDGE.

3. PRIOR TO THE START OF CONSTRUCTION, THE DESIGNATED INSPECTION AGENCY SHALL SUBMIT A PROPOSED INSPECTION AND TESTING SCHEDULE TO THE ARCHITECT AND ENGINEER OF RECORD FOR REVIEW AND APPROVAL.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

SPECIAL INSPECTIONS 2

PROJECT TITLE:

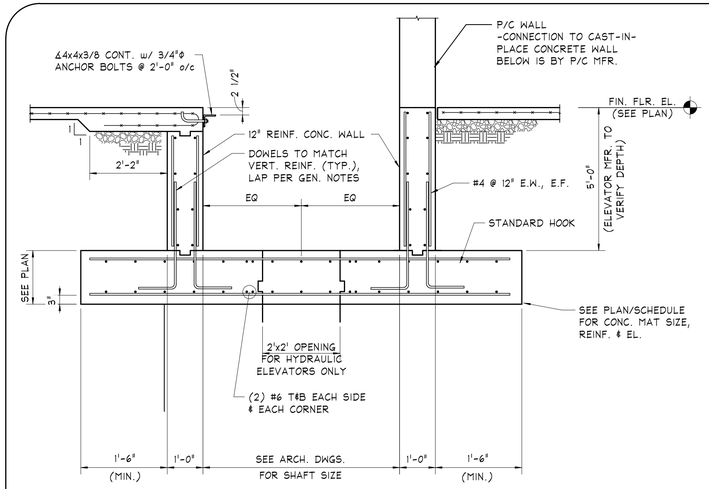
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

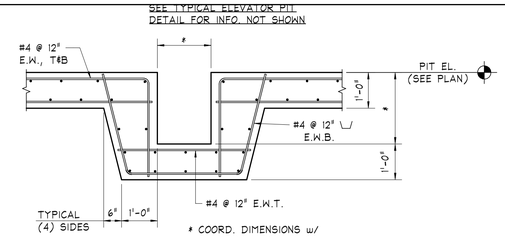
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

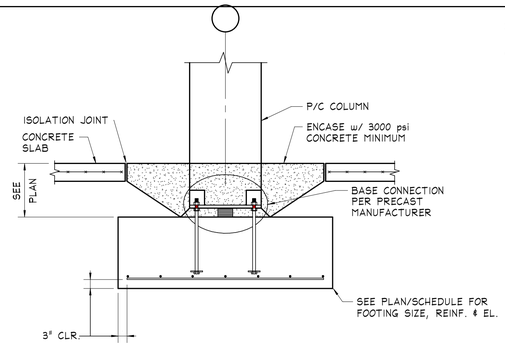
Drawing No.
S-202



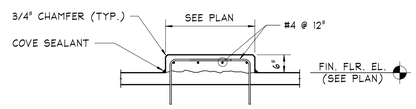
TYPICAL ELEVATOR PIT SECTION



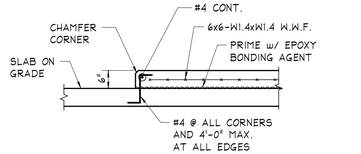
TYPICAL SUMP DETAIL at CENTER OF PIT



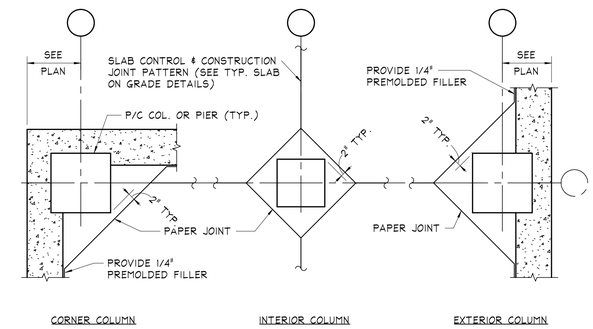
TYPICAL PRECAST COLUMN TO FOOTING CONNECTION DETAIL



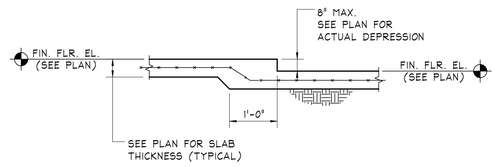
TYPICAL ISLAND DETAIL



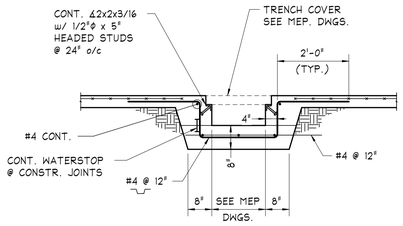
TYPICAL HOUSEKEEPING PAD DETAIL



TYPICAL ISOLATION JOINT DETAILS

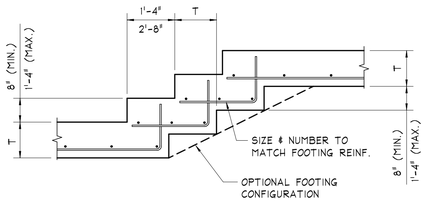


TYPICAL DEPRESSED SLAB DETAIL

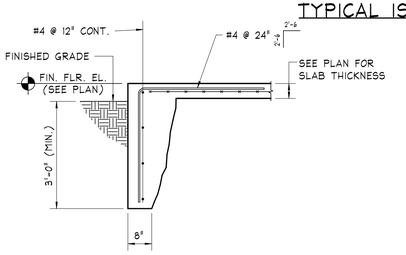


SEE ARCH. AND MECH. DWGS FOR TRENCH DRAIN LOCATIONS & DIMENSIONS

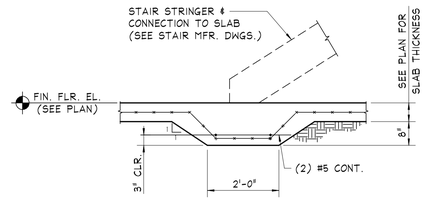
TRENCH DRAIN IN SLAB ON GRADE TYPICAL DETAIL



TYPICAL STEPPED FOOTING DETAIL



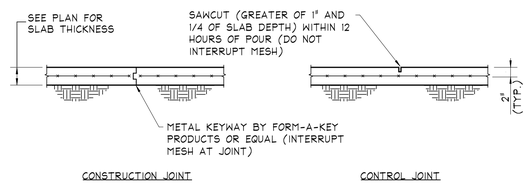
TYPICAL TURNED DOWN SLAB DETAIL



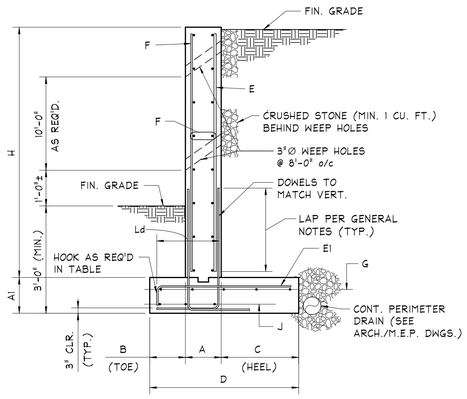
TYPICAL THICKENED SLAB-ON-GRADE DETAIL @ STAIR

(SEE ARCH. DWGS. FOR LOCATIONS, COORD. w/ STAIR MFR.)

NOTE: CONTROL JOINTS/CONSTRUCTION JOINTS SHALL CREATE PANELS OF 225 SQ. FEET (MAXIMUM), WITH PANEL ASPECT RATIOS NO GREATER THAN 1.5 TO 1.



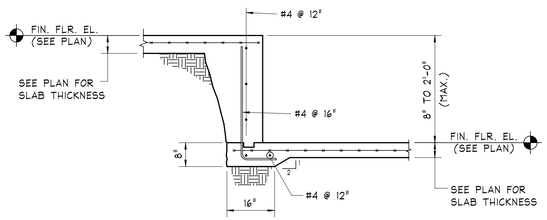
TYPICAL SLAB ON GRADE DETAILS



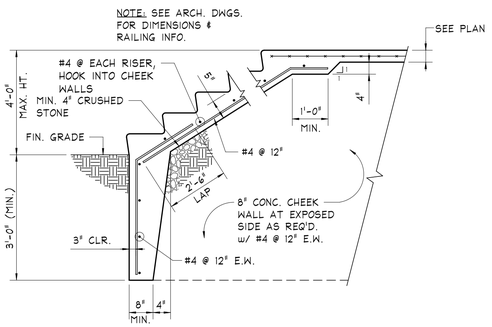
TYPICAL CONCRETE SITE RETAINING WALL

CONCRETE SITE RETAINING WALL SCHEDULE/NO SURCHARGE											
WALL	H	A	A1	B	C	D	E	EI	F	G	J
RW1	0'-0" TO 6'-0"	1'-0"	1'-0"	0'-8"	1'-10	3'-6"	#4@12"	#4@12"	#4@12"	#4@12"	(3)#4
RW2	6'-0" TO 8'-0"	1'-0"	1'-0"	1'-4"	3'-8"	6'-0"	#5@12"	#5@12"	#4@12"	#4@12"	(3)#4
RW3	8'-0" TO 10'-0"	1'-0"	1'-0"	1'-4"	5'-8"	8'-0"	#5@10"	#5@10"	#4@12"	#4@12"	(4)#4
RW4	10'-0" TO 12'-0"	1'-2"	1'-2"	1'-8"	6'-10"	9'-8"	#6@10"	#6@10"	#4@12"	#4@12"	(5)#4
RW5	12'-0" TO 14'-0"	1'-2"	1'-2"	2'-0"	8'-4"	11'-6"	#8@10"	#8@10" HK	#4@12"	#4@10"	(5)#4
RW6	14'-0" TO 16'-0"	1'-4"	1'-6"	2'-2"	9'-10"	13'-4"	#9@12"	#9@12" HK	#5@12"	#4@8"	(7)#4
RW7	16'-0" TO 18'-0"	1'-6"	1'-8"	2'-4"	11'-2"	15'-0"	#10@12"	#10@12"HK	#5@12"	#4@7"	(9)#4

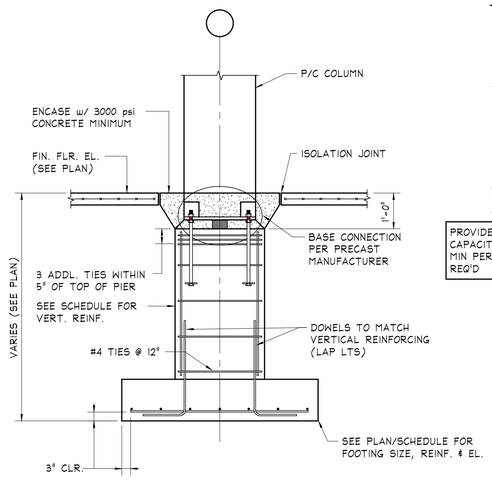
NOTE: "HK" DENOTES STANDARD 90° HOOK OF BAR @ TOE.



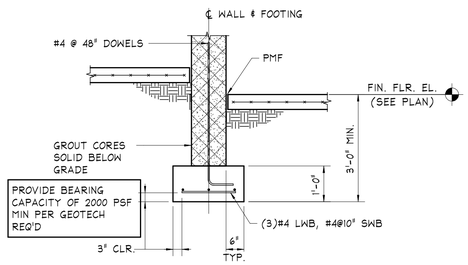
TYPICAL CHANGE IN SLAB ELEVATION DETAIL



TYPICAL CONCRETE STAIR ON GRADE DETAIL



TYPICAL PRECAST COLUMN WITH PIER



TYPICAL INTERIOR WALL FOOTING

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TYPICAL FOUNDATION DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

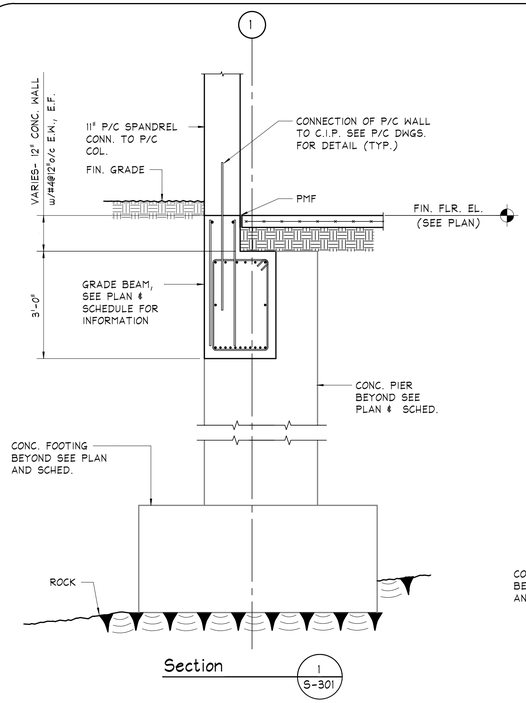
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

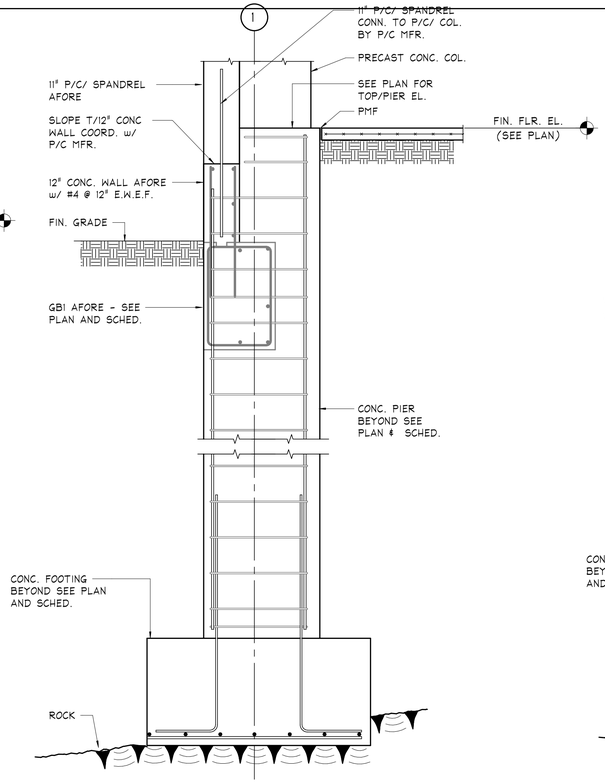
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

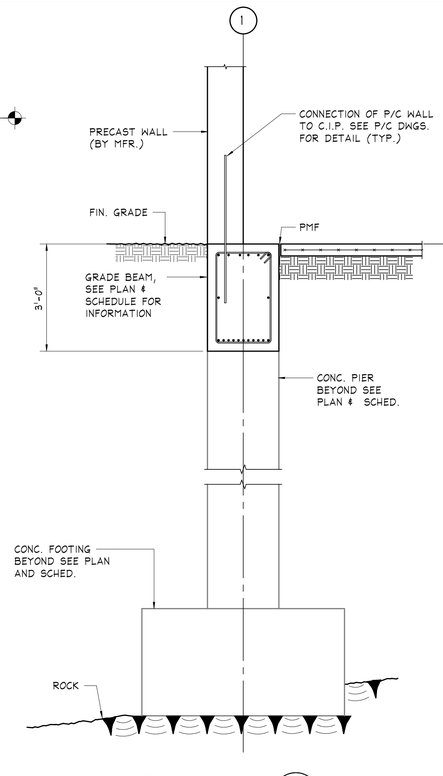
S-300



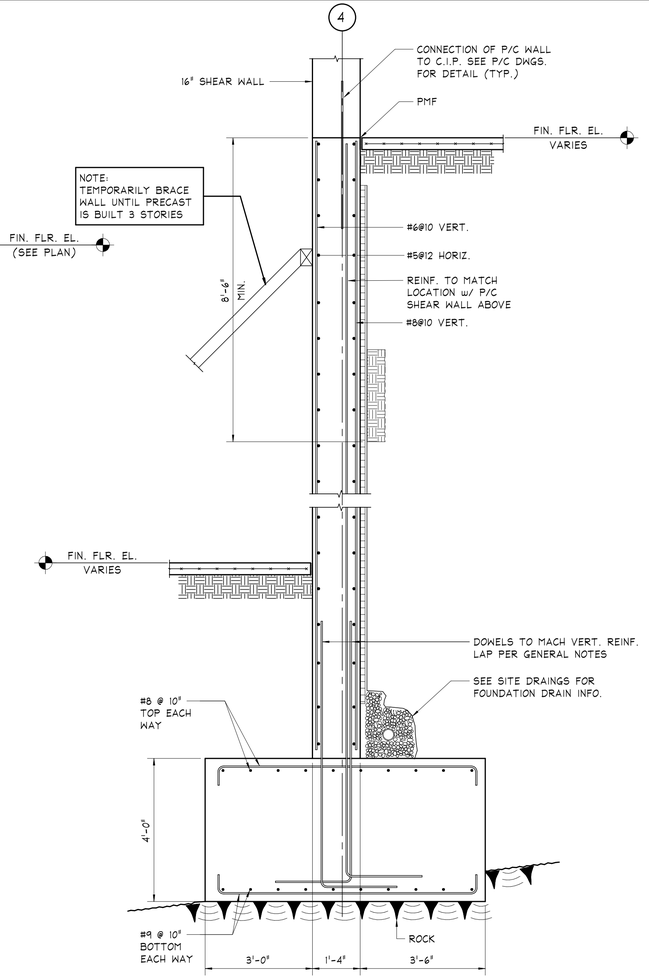
Section 1 S-301



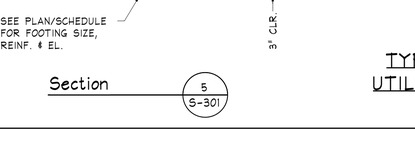
Section 2 S-301



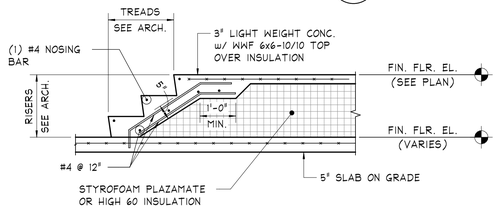
Section 3 S-301



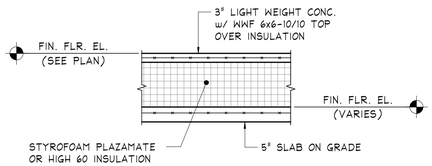
Section 4 S-301



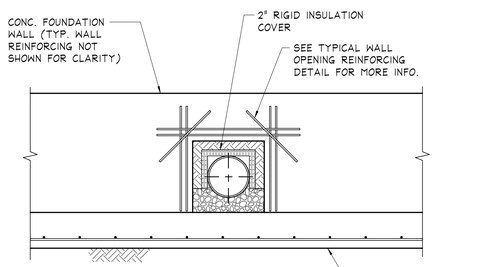
Section 4A S-301



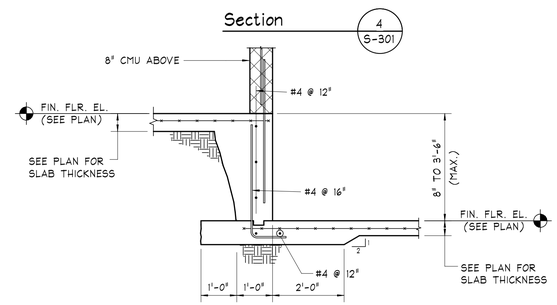
TYPICAL DETAIL AT RAISED FLOORS



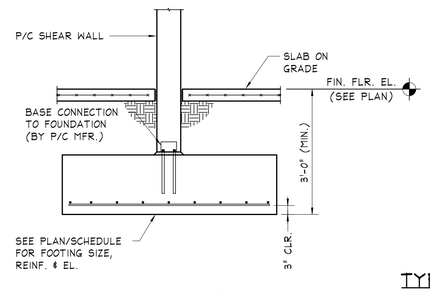
TYPICAL DETAIL AT RAISED FLOORS



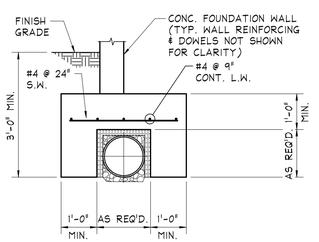
TYPICAL DETAIL FOR UTILITIES RUNNING THRU FOUNDATION WALL (DETAIL ELEVATION)



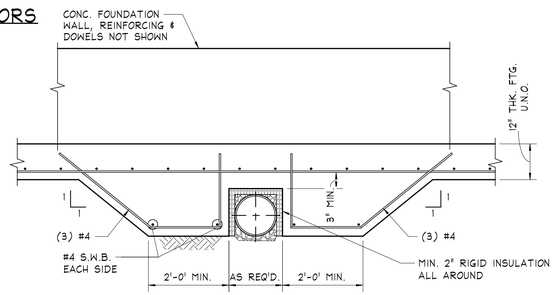
TYPICAL CHANGE IN SLAB ELEVATION DETAIL (> 2'-0")



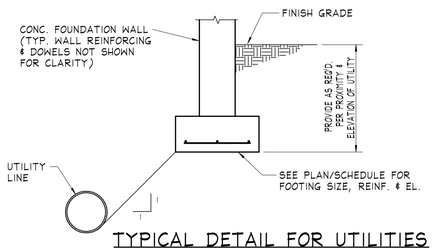
Section 5 S-301



TYPICAL SECTION WHERE EXISTING UTILITY LINE IS PARALLEL WITH NEW WALL FOOTING



TYPICAL DETAIL FOR UTILITIES RUNNING BELOW FOOTINGS (DETAIL ELEVATION)



TYPICAL DETAIL FOR UTILITIES ADJACENT TO FOOTINGS

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

FOUNDATION SECTIONS & DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

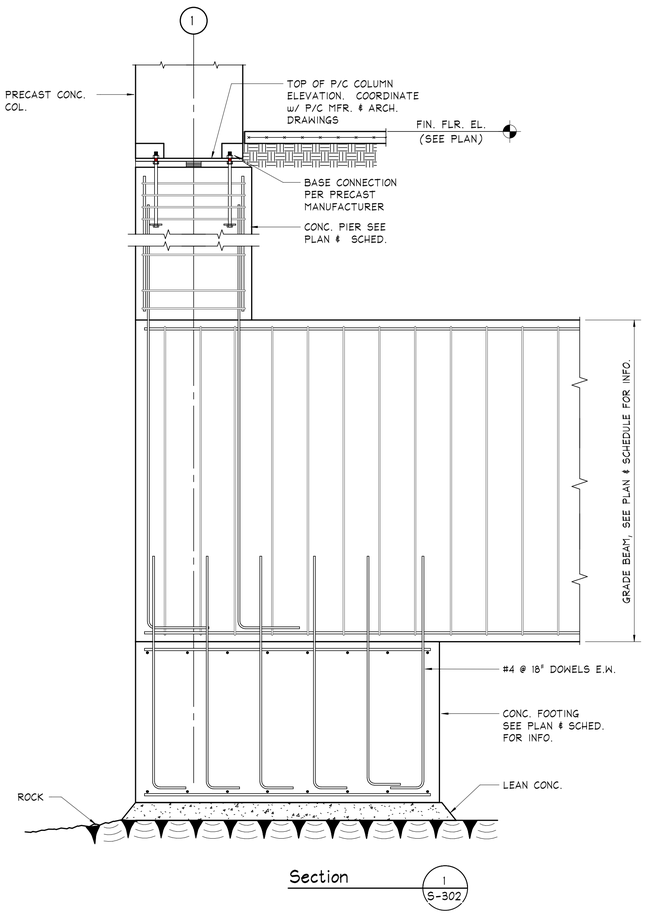
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

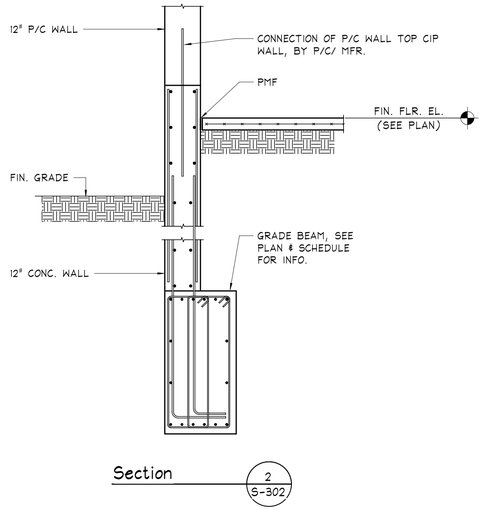
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

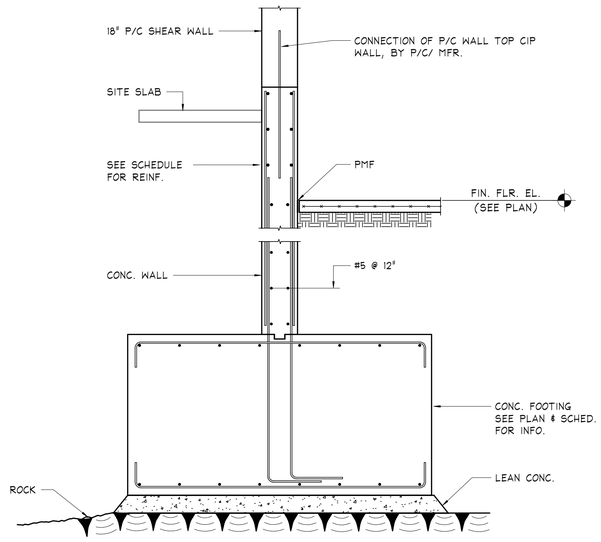
S-301



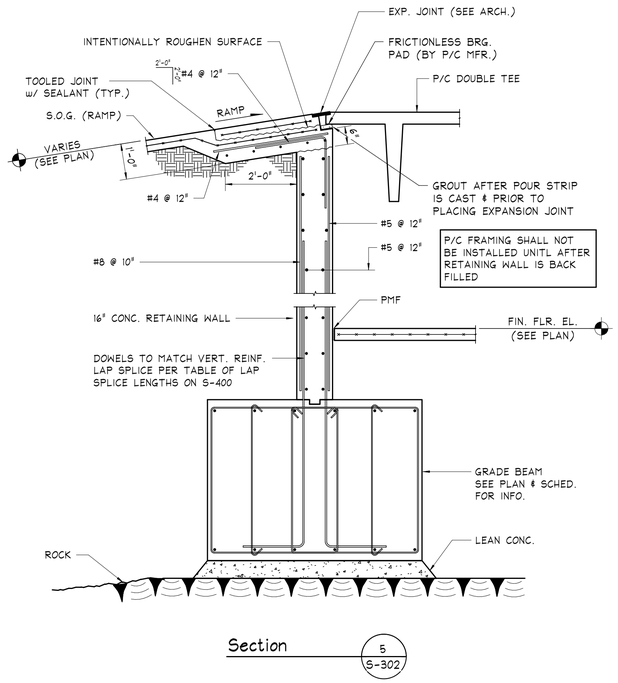
Section 1 S-302



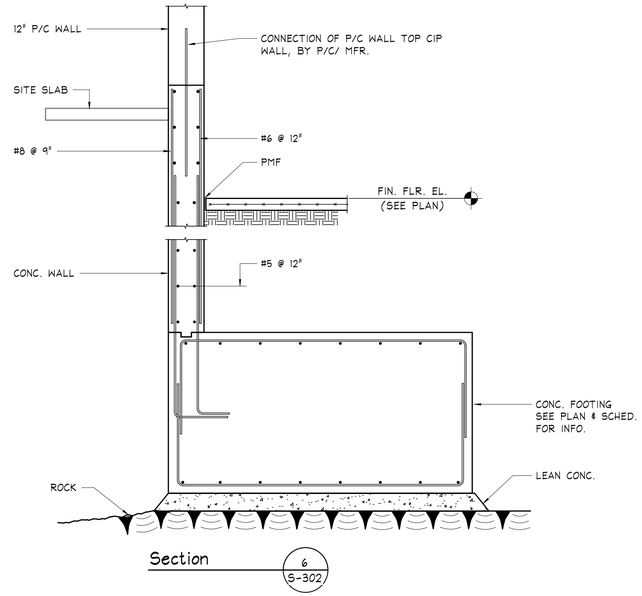
Section 2 S-302



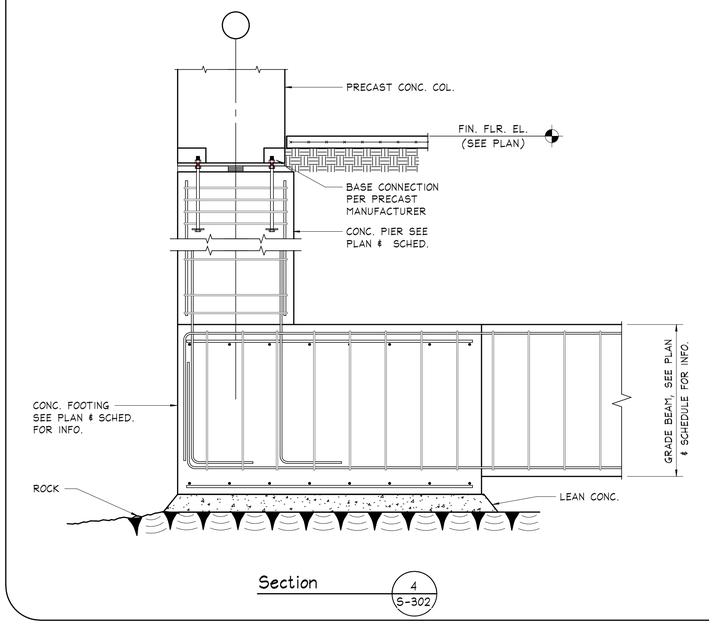
Section 3 S-302



Section 5 S-302



Section 6 S-302



Section 4 S-302

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

FOUNDATION SECTIONS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

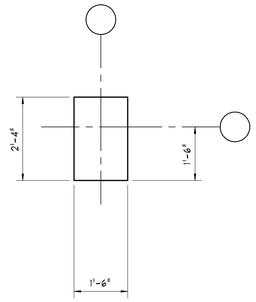
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

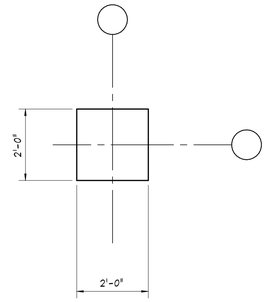
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

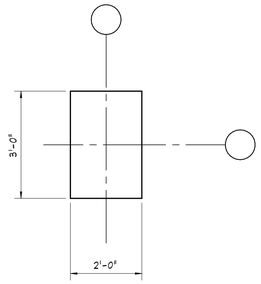
S-302



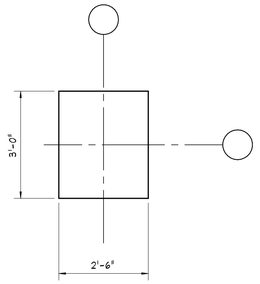
P/C COLUMN - PCC1



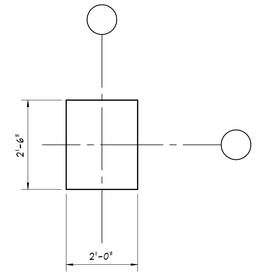
P/C COLUMN - PCC2



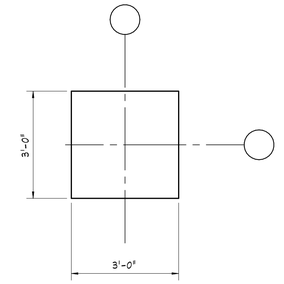
P/C COLUMN - PCC3



P/C COLUMN - PCC4



P/C COLUMN - PCC5



P/C COLUMN - PCC6

PRECAST COLUMN PLAN DETAILS

NOTES:

1) DIMENSIONS SHOWN ARE SCHEMATIC ONLY. COORDINATE ALL FINAL DIMENSIONS w/ ARCHITECTURAL DRAWINGS.

2) PRECAST COLUMNS SHALL BE DESIGNED BY THE PRECAST MANUFACTURER FOR ALL APPLICABLE GARAGE LOADING.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

PRECAST COLUMNS

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-303

TABLE OF DEVELOPMENT AND LAP SPLICE LENGTH (IN INCHES)

BAR SIZE	COMPRESSION		TENSION (f'c = 4,000 psi)								TENSION (f'c = 6,000 psi)							
			DEVELOPMENT LENGTH				LAP SPLICE LENGTH				DEVELOPMENT LENGTH				LAP SPLICE LENGTH			
			TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS	
	DEVELOPMENT LENGTH	STANDARD LAP SPLICE LENGTH	CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1	
			I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
#3	8	12	19	28	14	21	24	36	19	28	16	23	12	17	20	29	16	23
#4	11	15	25	37	19	28	36	48	25	37	20	30	15	23	26	39	20	30
#5	14	19	31	46	24	36	40	60	31	46	25	38	19	29	33	49	25	38
#6	17	23	37	55	28	43	48	72	37	55	30	45	23	35	39	59	30	45
#7	19	27	54	81	42	62	70	105	54	81	44	66	34	51	57	86	44	66
#8	22	30	62	92	47	71	80	120	62	92	50	76	39	58	65	98	50	76
#9	25	34	70	104	54	80	90	136	70	104	57	85	44	66	74	111	57	85
#10	28	39	78	117	60	90	102	153	78	117	64	96	49	74	83	125	64	96
#11	31	43	87	130	67	100	113	170	87	130	71	106	54	82	92	138	71	106
#14	38																	
#18	50																	
NOTATION USED ON DWG.	LCD	LCS	LD				LTS				LD				LTS			

NOTES:
1) THE SCHEDULE INCLUDES SPLICE AND DEVELOPMENT LENGTHS WHICH SATISFY THE PROJECT REQUIREMENTS AND THE FOLLOWING CRITERIA:
fy = 60,000 psi (75,000 psi FOR #14 AND #18 BARS).
CONCRETE WEIGHT = 150 lb/cu.ft.
TENSION DEVELOPMENT AND LAP SPLICE LENGTHS ARE DIVIDED INTO TWO CATEGORIES WHICH SHALL BE APPLIED AS FOLLOWS:
CATEGORY I CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN db, CLEAR COVER NOT LESS THAT db, AND BEAM STIRRUPS OR COLUMN TIES THROUGHOUT Ld NOT LESS THAN THE CODE MINIMUM
OR
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN 2db & CLEAR COVER NOT LESS THAN db.

CATEGORY II BARS NOT COVERED BY CATEGORY I

2) USE COMPRESSION LAP SPLICE LENGTH (LCS) AT ALL COLUMN SPLICE LOCATIONS NOT SPECIFICALLY DETAILED AND UNLESS INDICATED OTHERWISE ON PLANS OR DETAILS. USE TENSION LAP SPLICE LENGTH (LTS) FOR ALL OTHER SPLICES (UNLESS OTHERWISE SHOWN ON DRAWINGS).

3) THE STANDARD LAP SPLICE (0.0005 X fy X D) IS USED FOR COMPRESSION SPLICES AND THE CLASS "B" SPLICE IS USED FOR TENSION SPLICES. THE CONTRACTOR MAY SUBMIT LESSER SPLICE LENGTHS FOR REVIEW AND APPROVAL AT THE SAME TIME PROVIDING THE FOLLOWING INFORMATION.
   A. DETAILS PREPARED AND SUBMITTED BY THE CONTRACTOR INDICATING LOCATION AND PROPOSED LAYOUT OF REBARS AND LENGTHS OF SPLICES.
   B. WHERE THE SIZE AND NUMBER OF TIES OR SPIRALS PERMIT THE REDUCTION OF LAP LENGTH, THOSE BARS SHALL BE INDICATED ON THE DETAILS.
   C. WHERE COMPUTED STRESS VALUES PERMIT THE REDUCTION OF LAP LENGTH, COMPUTATIONS SHALL BE SUBMITTED FOR REVIEW.
   D. THE APPLICABLE SECTION OF THE ACI CODE PERMITTING THE LESSER SPLICE LENGTH SHALL BE INDICATED ON THE SUBMITTED MATERIAL.

4) TOP BARS ARE HORIZONTAL BARS PLACED SO THAT MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW THE BAR.

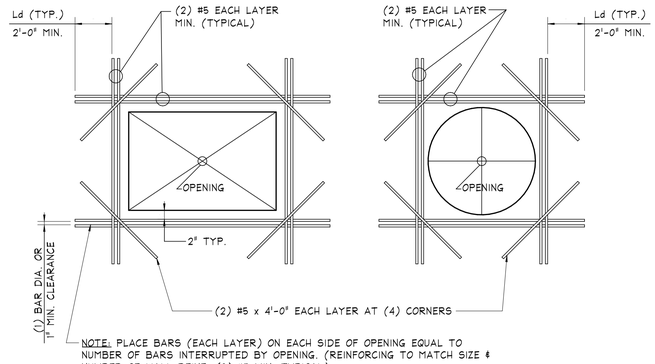
5) WHERE BARS OF DIFFERENT SIZE ARE TO BE SPLICED, THE SPLICE LENGTH FOR ALL BARS SHALL BE THAT REQUIRED FOR THE LARGEST.

6) WHEN LIGHTWEIGHT CONCRETE IS USED, THE VALUES LISTED IN THE TABLE FOR TENSION DEVELOPMENT + LAP SPLICE LENGTHS SHALL BE INCREASED BY 30%.

7) WHEN REINFORCING BARS ARE EPOXY-COATED, ALL VALUES IN THE TABLE SHALL BE INCREASED BY 50%.

8) COMBINATIONS OF EFFECTS DUE TO CONCRETE WEIGHT AND EPOXY BARS ARE CUMULATIVE. LD SHALL BE MULTIPLIED BY EACH FACTOR TO FIND THE CORRECT VALUE.

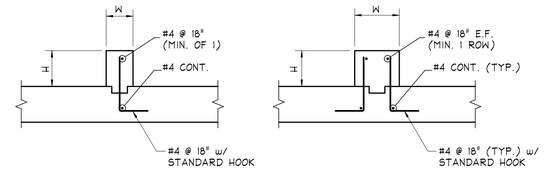
9) ACI DOES NOT PERMIT LAP SPLICES OF #14 OR #18 BARS. BARS OF THIS SIZE SHALL BE COUPLED BY ACCEPTABLE MECHANICAL MEANS, WHICH ARE RATED TO DEVELOP 125 PERCENT OF Fy OF THE BAR.



NOTE: PLACE BARS (EACH LAYER) ON EACH SIDE OF OPENING EQUAL TO NUMBER OF BARS INTERRUPTED BY OPENING. (REINFORCING TO MATCH SIZE & NUMBER OF WALL REINF. (2) #5 MIN. TYPICAL)

TYPICAL WALL OPENING REINFORCING DETAIL (CAST IN PLACE CONCRETE SECTION)

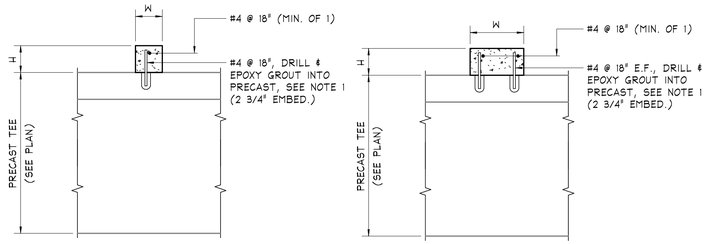
(NOTE: Ld PER TABLES FOR DEVELOPMENT LENGTH)



'W' LESS THAN OR EQUAL TO 8" 'W' GREATER THAN 8"

TYPICAL CONCRETE CURB DETAIL

(FOR CURB DIMENSIONS 'W' & 'H' SEE ARCH. DWGS.)



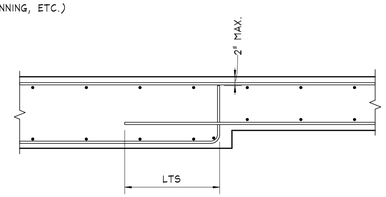
'W' LESS THAN OR EQUAL TO 8" & 'H' EQUAL TO 6"

'W' GREATER THAN 8" & 'H' EQUAL TO 6"

TYPICAL CONCRETE CURB DETAIL @ PRECAST

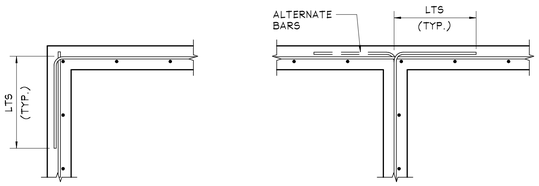
(FOR CURB DIMENSIONS 'W' & 'H' SEE ARCH. DWGS.)

NOTE 1: DO NOT CUT ANY REINFORCING IN PRECAST SLAB. COORDINATE w/ PRECAST MFR. FOR ALL REQUIREMENTS (LOCATION, SCANNING, ETC.)



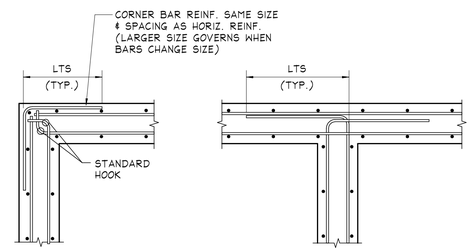
PLAN VIEW

TYPICAL CHANGE IN WALL THICKNESS DETAIL



AT CORNERS AT WALL INTERSECTIONS

PLAN VIEWS (ONE LAYER)

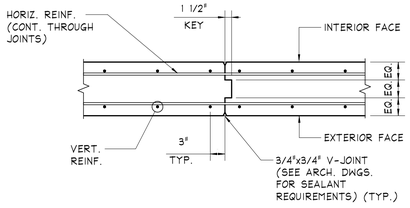


AT CORNERS AT WALL INTERSECTIONS

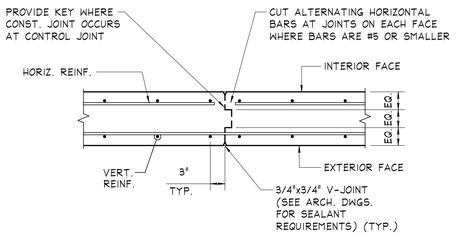
PLAN VIEWS (TWO LAYERS)

TYPICAL DETAIL - REINFORCING FOR CONCRETE WALLS

NOTES:
1) LTS PER TABLE OF LAP SPLICE LENGTHS.
2) SEE PLANS AND SECTIONS FOR SIZE AND SPACING OF REINFORCEMENT AND WALL THICKNESS.



TYPICAL VERTICAL CONSTRUCTION JOINT IN CONCRETE WALL

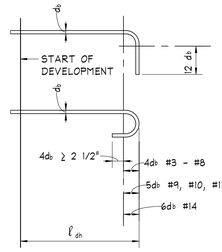


TYPICAL VERTICAL CONTROL JOINT IN CONCRETE WALL

(PROVIDE @ 30'-0" o/c MAXIMUM)

MINIMUM CONCRETE WALL REINFORCEMENT		
WALL THICKNESS	DIRECTION	REINFORCING
8"	HORIZONTAL	#4 @ 16" EACH FACE
	VERTICAL	#4 @ 16" EACH FACE
10"	HORIZONTAL	#4 @ 16" EACH FACE
	VERTICAL	#4 @ 16" EACH FACE
12"	HORIZONTAL	#4 @ 12" EACH FACE
	VERTICAL	#4 @ 12" EACH FACE
14"	HORIZONTAL	#4 @ 12" EACH FACE
	VERTICAL	#4 @ 12" EACH FACE
16"	HORIZONTAL	#4 @ 12" EACH FACE
	VERTICAL	#4 @ 12" EACH FACE

NOTE: THE REINFORCEMENT SHOWN SHALL BE PLACED IN CONCRETE WALLS UNLESS NOTED OTHERWISE.



ℓdh (IN INCHES)

BAR #	f'c							
	3,000 psi	4,000 psi	5,000 psi	6,000 psi	7,000 psi	8,000 psi	9,000 psi	≥10,000 psi
3	6	6	6	6	6	6	6	6
4	8	7	6	6	6	6	6	6
5	10	9	8	7	7	6	6	6
6	12	10	9	9	8	8	7	7
7	14	12	11	10	9	9	8	8
8	16	14	12	11	11	10	9	9
9	18	15	14	13	12	11	10	10
10	20	17	16	14	13	12	12	11
11	22	19	17	16	15	14	13	12
14	33	29	26	23	22	20	19	18

TABLE OF HOOKED BAR DEVELOPMENT LENGTHS

NOTES:
1) CONCRETE SIDE COVER ON BARS ≥ 2.5".
2) FOR EPOXY-COATED BARS, MULTIPLY TABULATED VALUES BY 1.3.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TYPICAL FRAMING DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

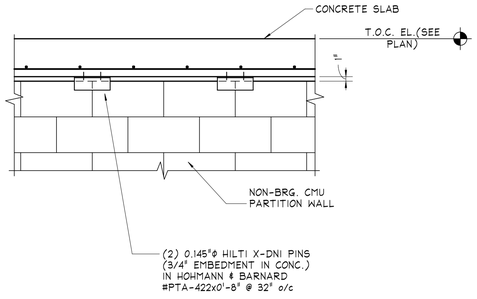
SUBMISSION:
ISSUED FOR BIDDING

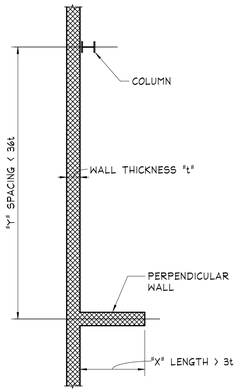
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-400



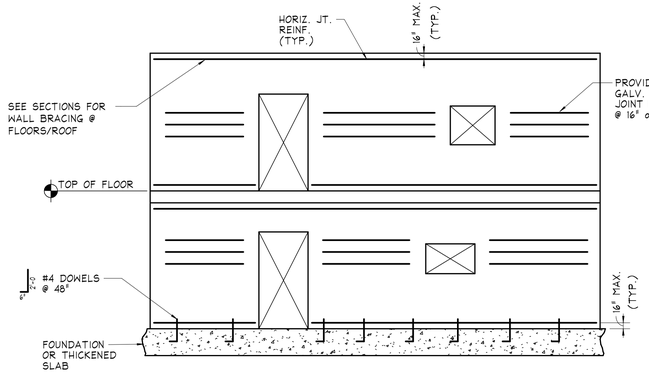


TYPICAL DETAILS @ TOP OF INTERIOR NON-LOADBEARING CMU PARTITION WALLS

NOTE:
1) COORDINATE w/ ARCH. DWGS. FOR ALL LOCATIONS, T.O. WALL HEIGHTS, ETC.
2) IF WALLS OCCUR WHERE COLUMNS, OR PERPENDICULAR WALLS OF AT LEAST "X"=3t IN LENGTH, ARE SPACED LESS THAN "Y"=36t APART, THEN DETAILS ABOVE ARE NOT REQUIRED.

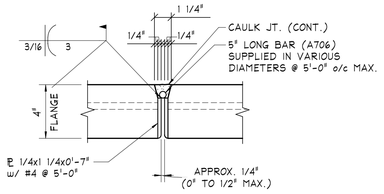
PLAN DETAIL OF TYPICAL INTERIOR CMU PARTITION LAYOUT

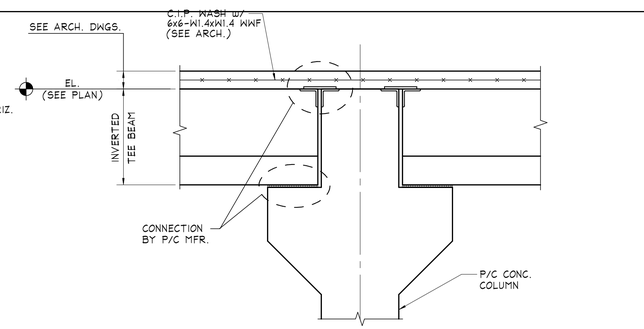
"t"	"X"	"Y"
4"	1'-0"	12'-0"
6"	1'-6"	18'-0"
8"	2'-0"	24'-0"
12"	3'-0"	36'-0"



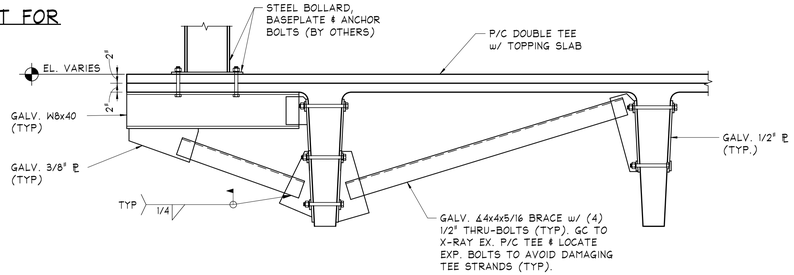
TYPICAL MINIMUM SEISMIC REINFORCEMENT FOR ALL UNREINFORCED CMU WALLS

NOTES:
1) FILL ALL CORES WITH REINFORCING BARS WITH 3000 PSI GROUT.
2) THIS IS MINIMUM REINFORCEMENT REQUIRED. SEE WALL SECTIONS AND SCHEDULES FOR ADDITIONAL REINFORCING.



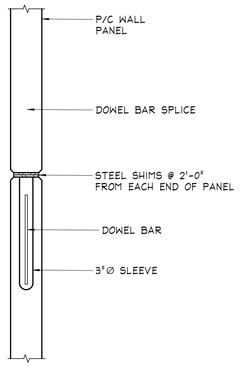


TYPICAL P/C BEAM TO P/C COLUMN CONNECTION DETAIL



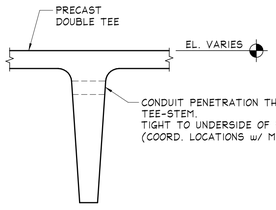
TYPICAL BOLLARD BRACING DETAIL @ STAIR 3

NOTE: COORDINATE QUANTITY & LOCATIONS WITH ARCH DRAWINGS.



TYPICAL WALL PANEL DETAIL

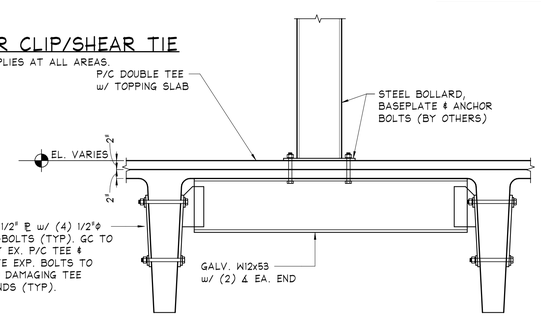
NOTE: SEE P/C DRAWINGS FOR ADDITIONAL INFORMATION.



TYPICAL CONDUIT PENETRATION THROUGH TEE-STEM DETAIL

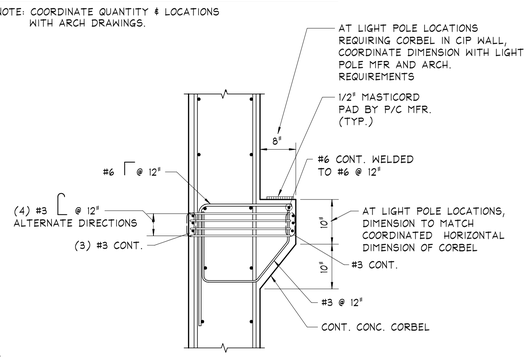
TYPICAL CAMBER CLIP/SHEAR TIE

NOTE: THIS DETAIL APPLIES AT ALL AREAS.



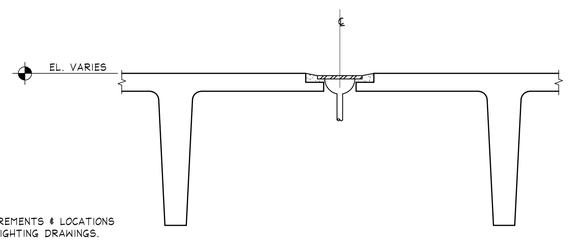
TYPICAL BOLLARD ANCHOR & POST DETAIL

NOTE: COORDINATE LOCATION WITH ARCH. DRAWINGS.



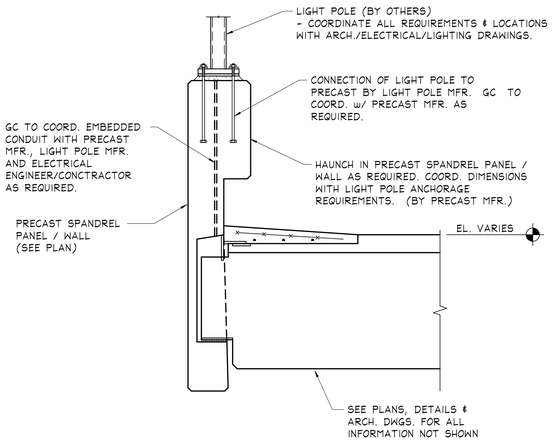
TYPICAL CONCRETE CORBEL DETAIL

SCALE: 3/4" = 1'-0"

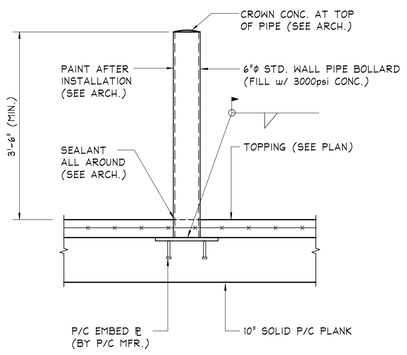


TYPICAL DRAIN DETAIL

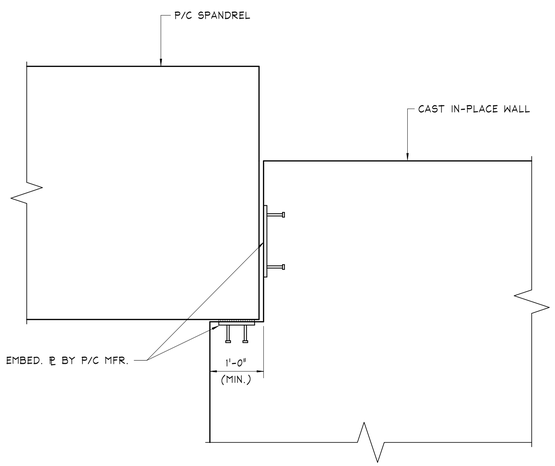
NOTE: COORDINATE QUANTITY & LOCATIONS WITH MEP DRAWINGS.



TYPICAL DETAIL FOR SUPPORT OF LIGHT POLE ON PRECAST WALL / PANEL



TYPICAL BOLLARD ON SOLID P/C PLANK DETAIL



TYPICAL P/C SPANDREL BEARING ON CIP WALL DETAIL

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TYPICAL FRAMING DETAILS

PROJECT TITLE:

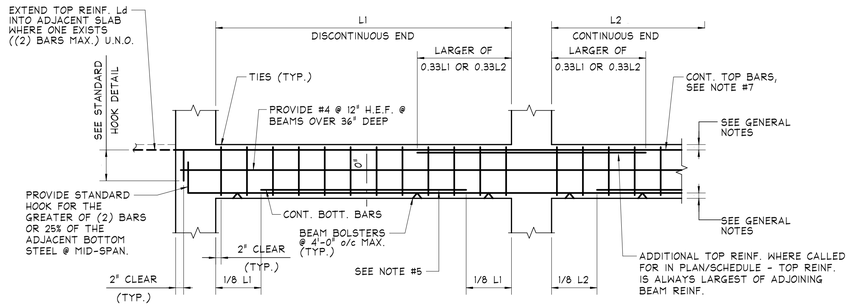
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

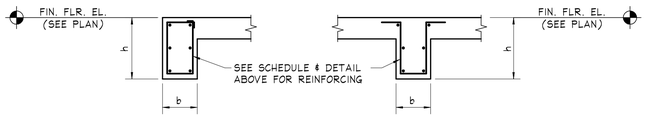
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.
S-401



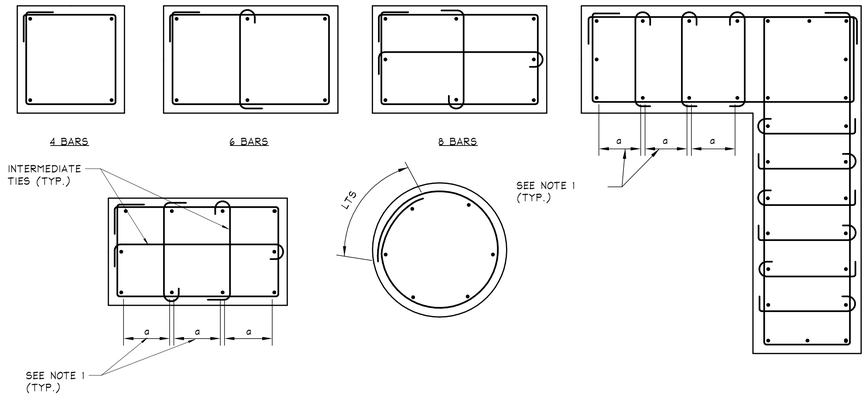
TYPICAL CONCRETE BEAM DETAIL



TYPICAL CONCRETE BEAM SECTIONS

NOTES:

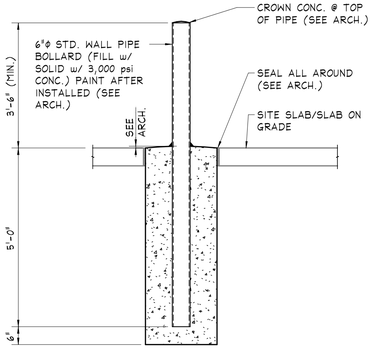
1) Ld IS PER TABLES FOR DEVELOPMENT LENGTH.
2) SEE BEAM SCHEDULES FOR SIZE & NUMBER OF TOP BARS, BOTTOM BARS & STIRRUPS.
3) IF BEAM IS MORE THAN 6" WIDER THAN COLUMN ON EITHER SIDE, PROVIDE STIRRUPS OVER COLUMN.
4) CONTINUOUS TOP BARS MAY HAVE A CLASS 'B' LAP SPLICE (LAP=LTS) AT MIDSPAN OF BEAM. CONTINUOUS BOTTOM BARS MAY HAVE A CLASS 'B' LAP SPLICE (LAP=LTS) AT MIDDLE OF SUPPORT.
5) NOT MORE THAN 50% OF BOTTOM BARS MAY BE TERMINATED 1/8L FROM FACE OF EACH SUPPORT. PROVIDE 1/4 OF THE GREATER OF THE BOTTOM LEFT OR BOTTOM RIGHT BARS, BUT A MINIMUM OF (2) BARS, MUST BE CONTINUOUS.
6) LONGITUDINAL BARS MAY ONLY BE PLACED IN MULTIPLE LAYERS IF NOTED IN SCHEDULE. PROVIDE 1" CLEAR BETWEEN LAYERS.
7) 1/6 OF THE GREATER OF THE TOP LEFT OR TOP RIGHT BARS, BUT MINIMUM OF (2) BARS, MUST BE CONTINUOUS.



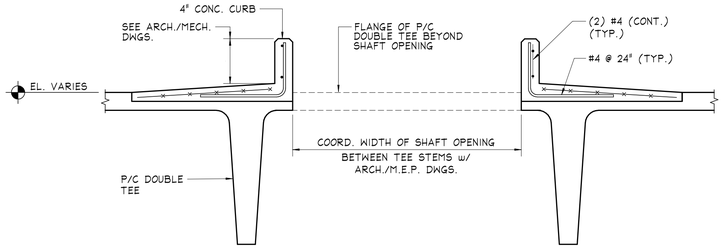
TYPICAL CONCRETE COLUMN DETAILS

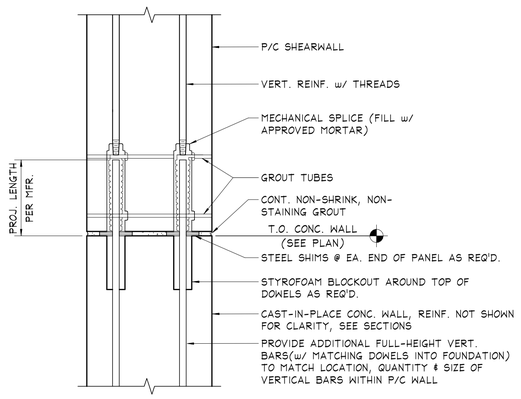
NOTES:

1) FOR CLEAR DISTANCE BETWEEN VERTICAL BARS OF $a \leq 6"$ ALTERNATE INTERMEDIATE TIES MAY BE OMITTED.
2) TOTAL NO. OF BARS SHOULD BE SPACED AROUND PERIMETER IN SUCH A WAY AS TO ACHIEVE APPROXIMATELY EQUAL SPACING.
3) THE ABOVE DETAILS APPLY ALSO AT PIERS.
4) MIN. CLEAR VERTICAL BAR SPACING SHALL BE PER REINFORCEMENT DEVELOPMENT LENGTH TABLE.
5) ALTERNATE THE LOCATION OF THE 90° AND 135° HOOKS ON SUCCESSIVE SETS OF TIES.
6) SEE TABLE OF COLUMN TIE SPACING THIS DRAWING.



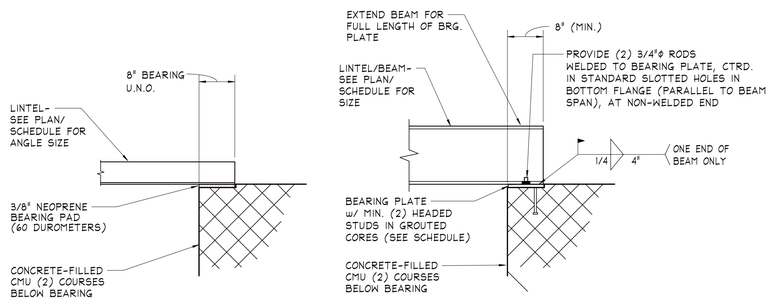
TYPICAL BOLLARD ON GRADE DETAIL





TYPICAL P/C SHEARWALL TO CAST-IN-PLACE WALL DETAIL

NOTE: THE INFORMATION SHOWN IS CONCEPTUAL ONLY. P/C MFR. TO PROVIDE FINAL DESIGN/DETAIL.



ANGLE LINTEL BEARING — WIDE-FLANGE LINTEL/BEAM BEARING

TYPICAL LINTEL/BEAM BEARING DETAILS

(AT CMU BEARING WALLS)

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TYPICAL FRAMING DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

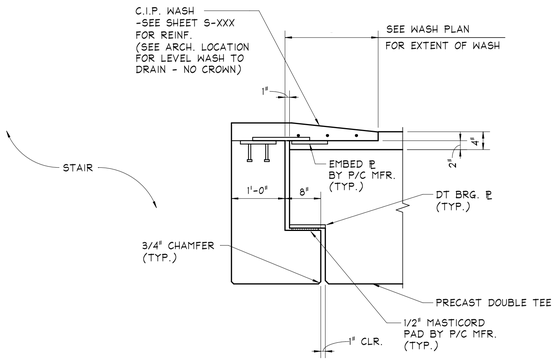
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

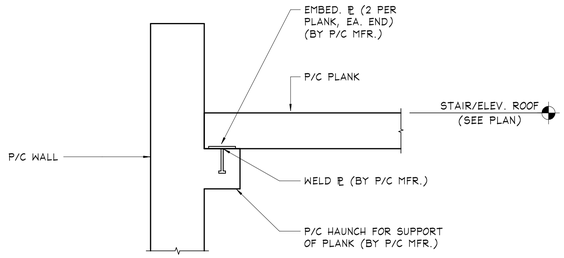
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

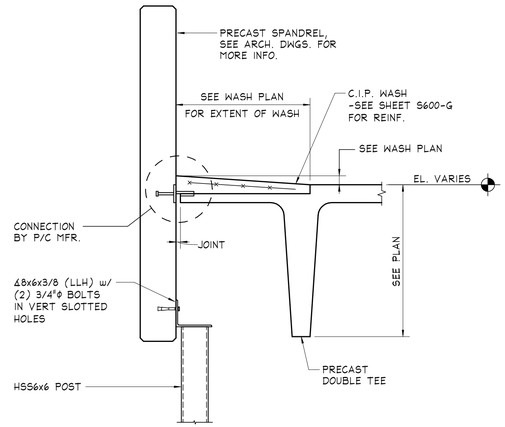
S-402



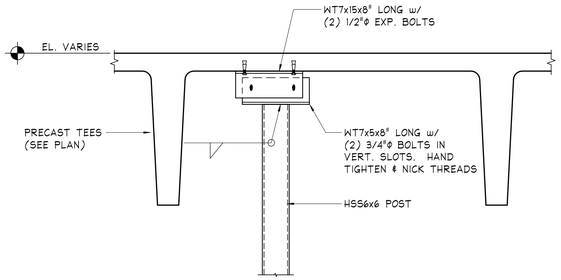
Section 1 S-403



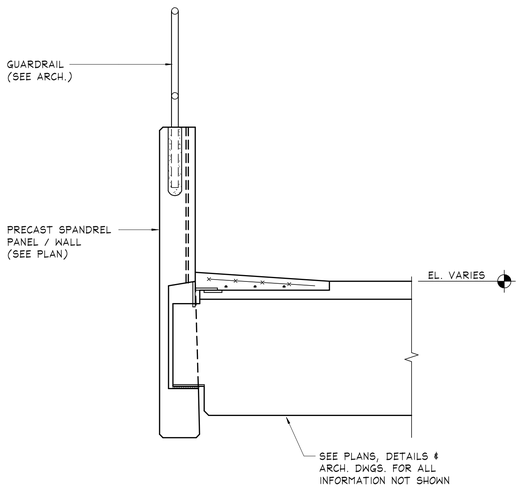
Section 2 S-403



Section 3 S-403



Section 4 S-403



SECTION AT ROOF

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

FRAMING SECTIONS

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

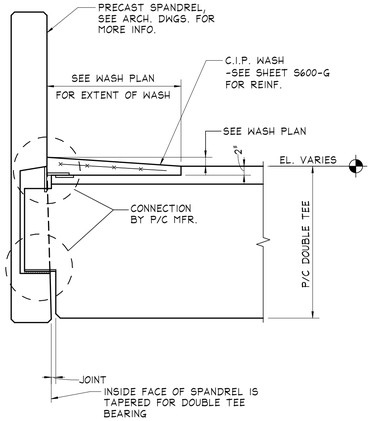
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

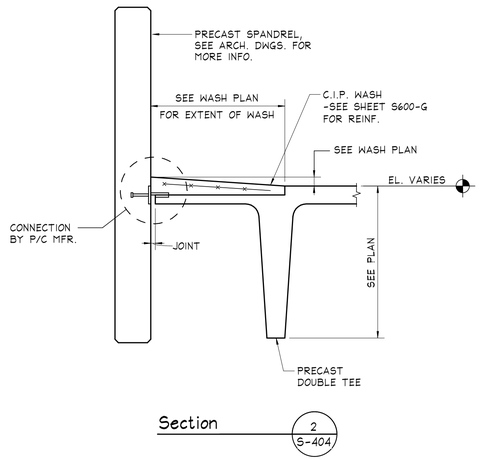
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

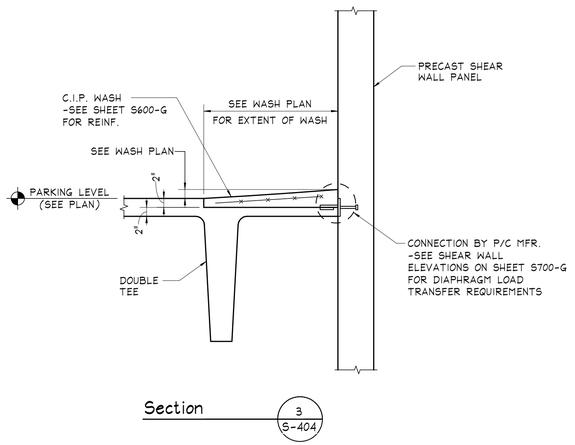
S-403



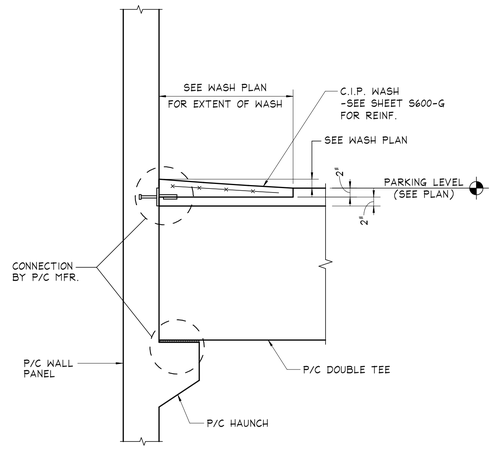
Section 1 S-404



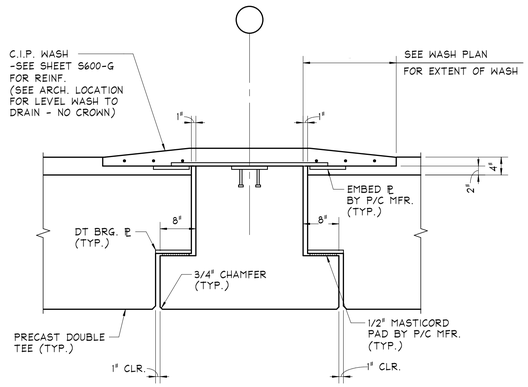
Section 2 S-404



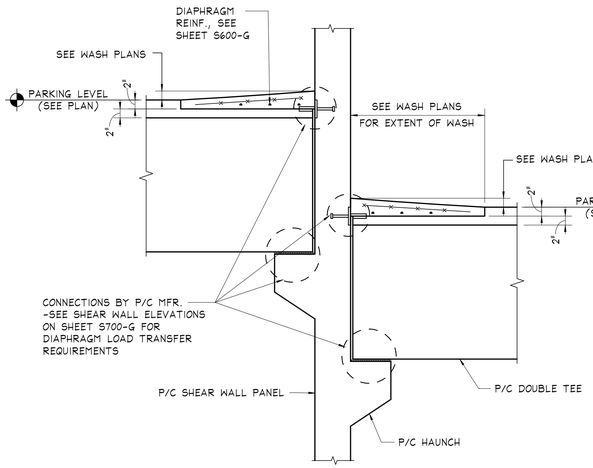
Section 3 S-404



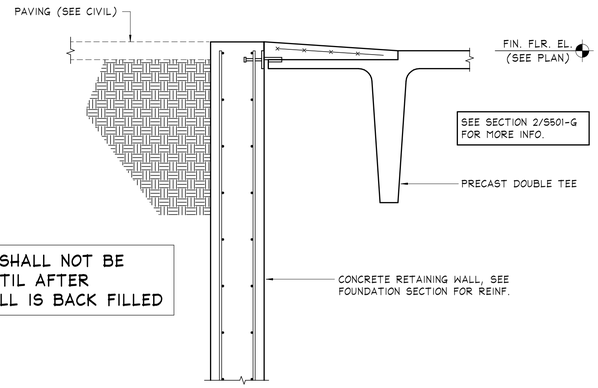
Section 4 S-404



Section 5 S-404

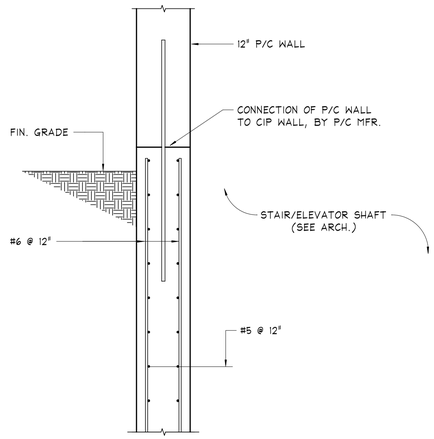


Section 6 S-404



Section 7 S-404

P/C FRAMING SHALL NOT BE INSTALLED UNTIL AFTER RETAINING WALL IS BACK FILLED



Section 8 S-404

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

FRAMING SECTIONS

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ. 07202

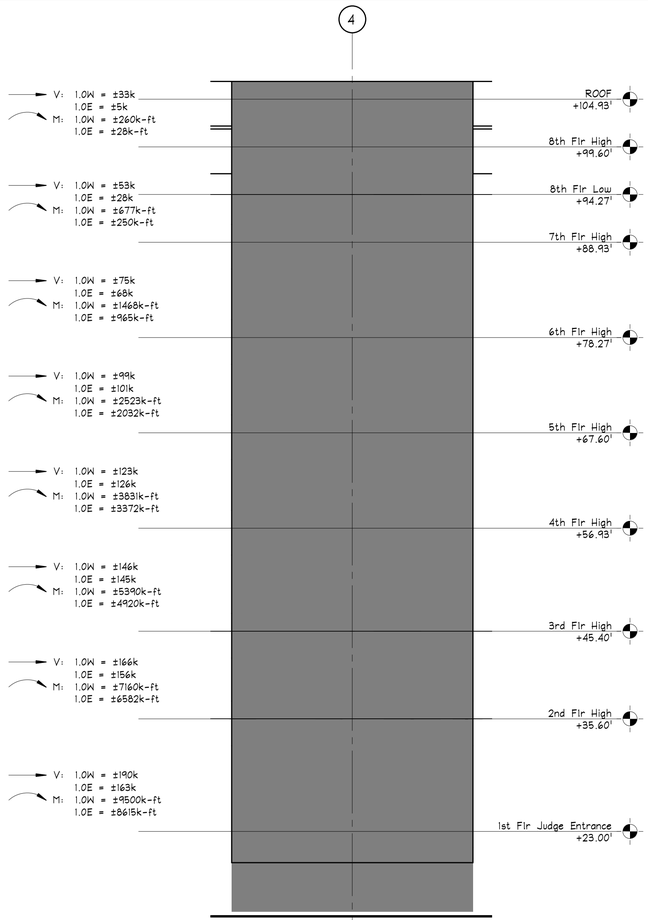
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-404



SHEARWALL ELEVATION 1
SCALE: 1/8" = 1'-0"

SHEARWALL NOTES

NOTES:
1) f'c FOR ALL PRECAST WALLS IS MINIMUM 6,000psi.

2) SEE PLANS FOR LOCATIONS.

3) COORDINATE LENGTHS AND LOCATION w/ ARCH. DRAWINGS.

4) PROVIDE DOWELS IN FOOTINGS/FOUNDATIONS TO MATCH VERTICAL WALL REINFORCING. ANCHORAGE OF ALL P/C SHEAR WALLS TO SUPPORT ELEMENTS IS TO BE PROVIDED BY THE P/C MFR.

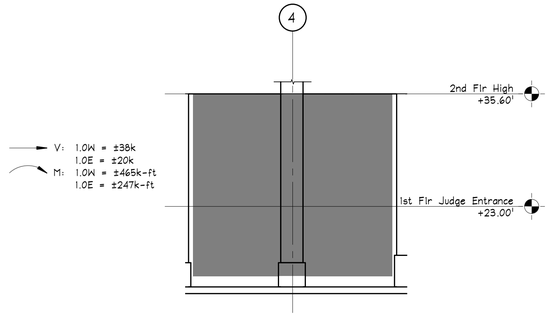
5) LOADS SHOWN ARE FACTORED/ULTIMATE LOADS. P/C MFR. TO COORDINATE AS REQUIRED. LOADS SHOWN ARE ACTUAL LOAD AT THE GIVEN LEVEL, CONTAINING ALL LOADS FROM LEVELS ABOVE. AT REQUEST, LOADS FROM INDIVIDIAL LOAD CASES WILL BE PROVIDED.

6) P/C MFR. / CONTRACTOR / ERECTOR TO COORDINATE SHEAR WALL ERECTION SEQUENCING AND ANY BRACING REQUIREMENTS WITH OVERALL CONSTRUCTION SCHEDULE.

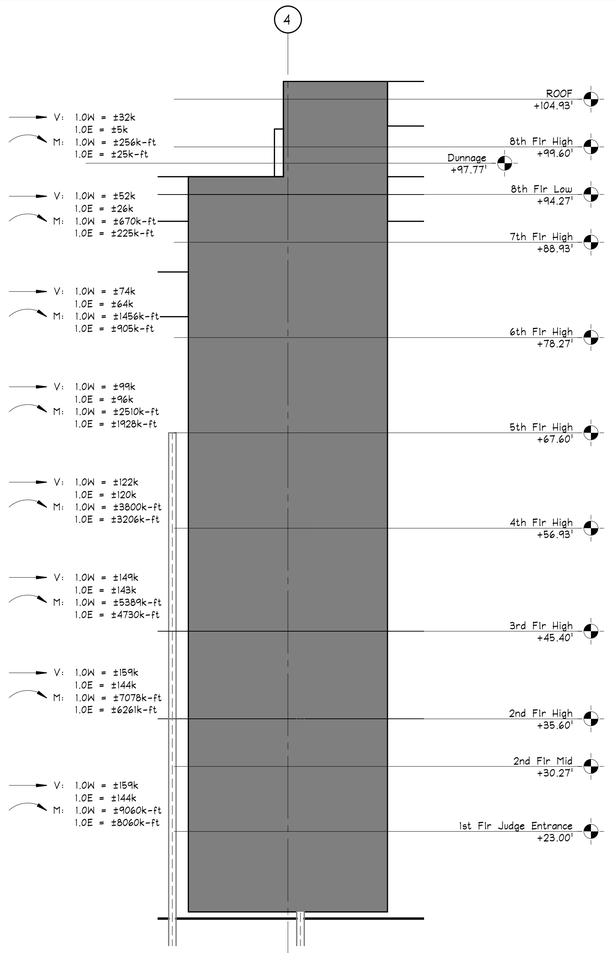
7) PRECAST MANUFACTURER IS TO SUBMIT COMPLETE SHOP DRAWINGS AND SIGNED AND SEALED DESIGN CALCULATIONS BY A REGISTERED ENGINEER IN THE STATE OF NEW JERSEY FOR REVIEW AND APPROVAL PRIOR TO ANY FABRICATION. ERECTION SHALL BE MADE ONLY FROM APPROVED SHOP DRAWINGS.

8) WALLS SHOWN ARE INTENDED TO BE CONTINUOUS FULL LENGTH (I.E. NO VERTICAL JOINTS). IF THE P/C MFR. PREFERS TO PROVIDE A JOINT, THE JOINT MUST BE DESIGNED BY THE P/C MFR. TO TRANSFER FORCES REQUIRED TO ALLOW THE FULL WALL LENGTH TO ACT MONOLITHICALLY.

9) ALL P/C CONNECTION DESIGN, INCLUDING, BUT NOT LIMITED TO, THE DESIGN OF CONNECTIONS OF DOUBLE TEES, SPANDREL PANELS, DIAPHRAGM REINFORCEMENT, ETC. TO SHEAR WALLS SHALL BE PROVIDED BY THE P/C MFR. TO ENSURE LOADS SHOWN ON ELEVATIONS ARE TRANSFERRED INTO P/C SHEAR WALLS.



SHEARWALL ELEVATION 2
SCALE: 1/8" = 1'-0"

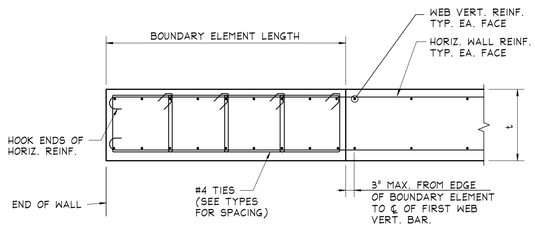


SHEARWALL ELEVATION 3
SCALE: 1/8" = 1'-0"

CONCRETE SHEAR WALL SCHEDULE

LEVEL	MARK	SW1	SW2	SW3	SW4	SW5
FDN.-GROUND	WEB VERT. REINF. (EA. FACE)	#6 @ 12"	#6 @ 12"	#6 @ 12"	SEE 4/S-301	SEE 4/S-301
	HORIZ. REINF. (EA. FACE)	#5 @ 12"	#5 @ 12"	#5 @ 12"	SEE 4/S-301	SEE 4/S-301
	BOUNDARY ELEMENT TYPE	N/A	N/A	N/A	N/A	N/A
	BOUNDARY ELEMENT VERT. REINF.	N/A	N/A	N/A	N/A	N/A
	BOUNDARY ELEMENT LENGTH	N/A	N/A	N/A	N/A	N/A
	WALL THICKNESS 't' (IN.)	18"	12"	18"	16"	16"
	f'c	.	.	.	.	.

NOTES:
1) f'c FOR ALL WALLS IS 6,000 psi U.N.O.
2) SEE PLANS FOR LOCATION.
3) COORDINATE LENGTHS AND LOCATIONS WITH ARCH. DRAWINGS.
4) PROVIDE MATCHING VERTICAL DOWELS INTO FOOTINGS/FOUNDATIONS.



TYPICAL BOUNDARY ELEMENT SHEAR WALL PLAN DETAIL
(EACH END OF WALL)

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

SHEARWALL ELEVATIONS

PROJECT TITLE:

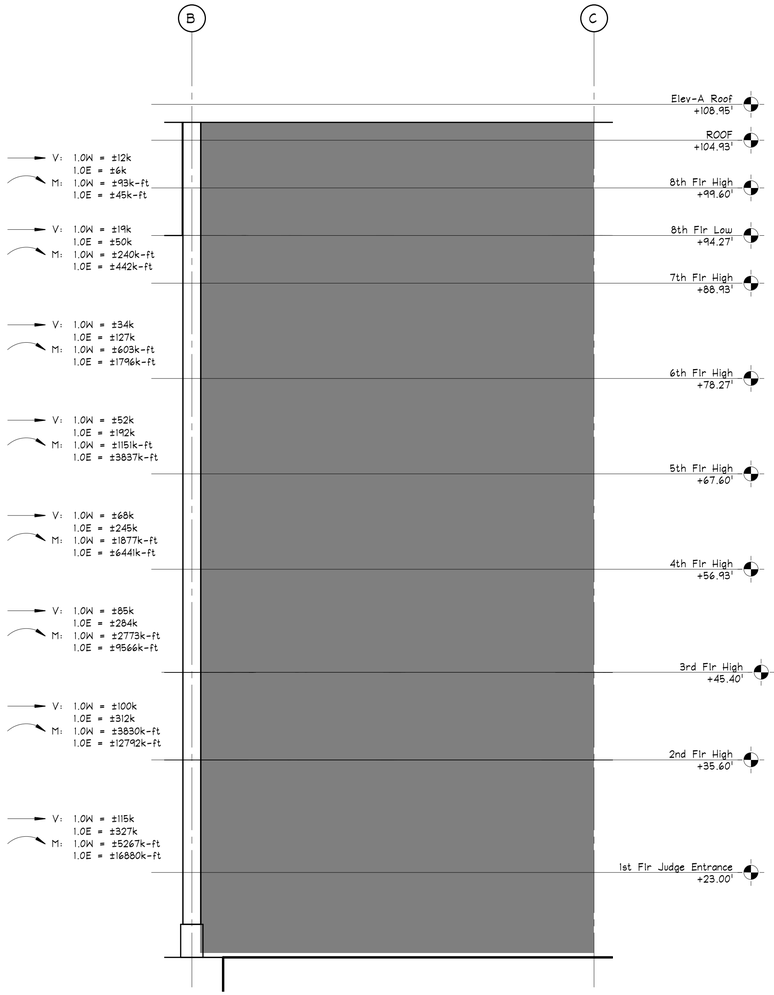
UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

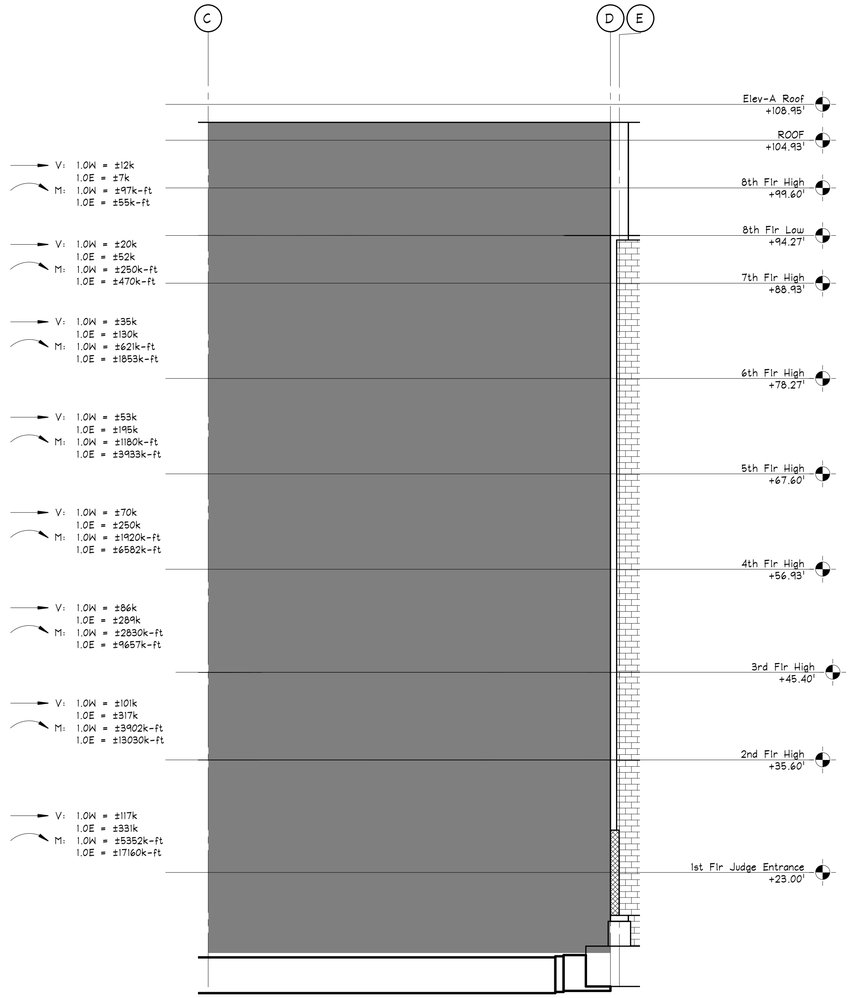
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.
S-500



SHEARWALL ELEVATION 4

SCALE: 1/8" = 1'-0"



SHEARWALL ELEVATION 5

SCALE: 1/8" = 1'-0"

SHEARWALL NOTES

NOTES:

1) f'c FOR ALL PRECAST WALLS IS MINIMUM 6,000psi.

2) SEE PLANS FOR LOCATIONS.

3) COORDINATE LENGTHS AND LOCATION w/ ARCH. DRAWINGS.

4) PROVIDE DOWELS IN FOOTINGS/FOUNDATIONS TO MATCH VERTICAL WALL REINFORCING. ANCHORAGE OF ALL P/C SHEAR WALLS TO SUPPORT ELEMENTS IS TO BE PROVIDED BY THE P/C MFR.

5) LOADS SHOWN ARE FACTORED/ULTIMATE LOADS. P/C MFR. TO COORDINATE AS REQUIRED. LOADS SHOWN ARE ACTUAL LOAD AT THE GIVEN LEVEL, CONTAINING ALL
LOADS FROM LEVELS ABOVE. AT REQUEST, LOADS FROM INDIVIDIAL LOAD CASES WILL BE PROVIDED.

6) P/C MFR. / CONTRACTOR / ERECTOR TO COORDINATE SHEAR WALL ERECTION SEQUENCING AND ANY BRACING REQUIREMENTS WITH OVERALL CONSTRUCTION SCHEDULE.

7) PRECAST MANUFACTURER IS TO SUBMIT COMPLETE SHOP DRAWINGS AND SIGNED AND SEALED DESIGN CALCULATIONS BY A REGISTERED ENGINEER IN THE STATE OF NEW JERSEY FOR REVIEW AND APPROVAL PRIOR TO ANY FABRICATION. ERECTION SHALL BE MADE ONLY FROM APPROVED SHOP DRAWINGS.

8) WALLS SHOWN ARE INTENDED TO BE CONTINUOUS FULL LENGTH (I.E. NO VERTICAL JOINTS). IF THE P/C MFR. PREFERS TO PROVIDE A JOINT, THE JOINT MUST BE DESIGNED BY THE P/C MFR. TO TRANSFER FORCES REQUIRED TO ALLOW THE FULL WALL LENGTH TO ACT MONOLITHICALLY.

9) ALL P/C CONNECTION DESIGN, INCLUDING, BUT NOT LIMITED TO, THE DESIGN OF CONNECTIONS OF DOUBLE TEES, SPANDREL PANELS, DIAPHRAGM REINFORCEMENT, ETC. TO SHEAR WALLS SHALL BE PROVIDED BY THE P/C MFR. TO ENSURE LOADS SHOWN ON ELEVATIONS ARE TRANSFERRED INTO P/C SHEAR WALLS.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

SHEARWALL ELEVATIONS 2

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

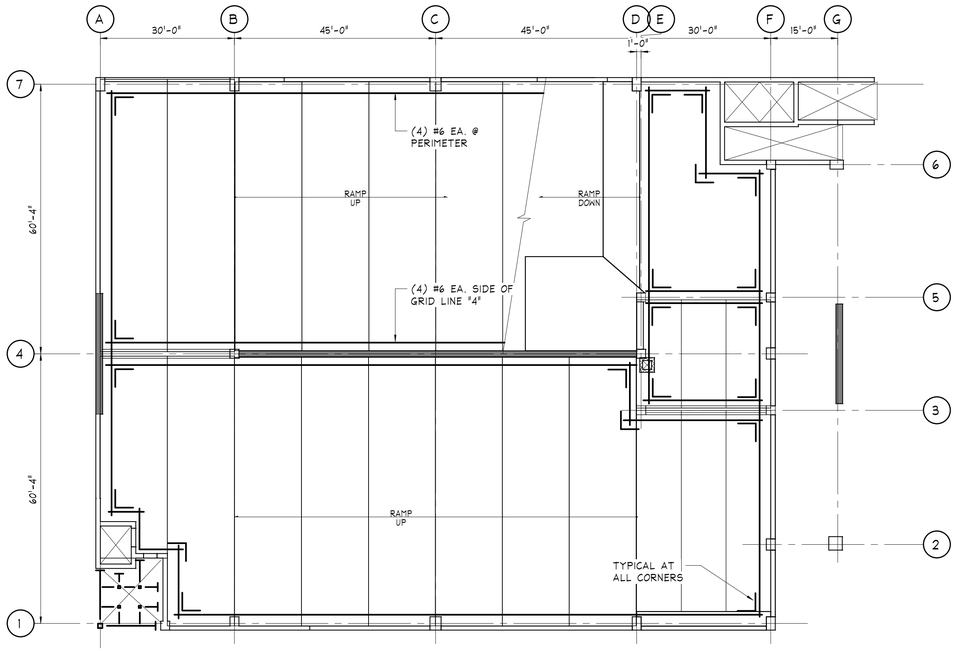
SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-501



SECOND TIER PLAN DIAPHRAGM REIFORCING

SCALE: 1/16" = 1'-0"

NOTES:

1) LAP ALL SPLICES PER GENERAL NOTES.

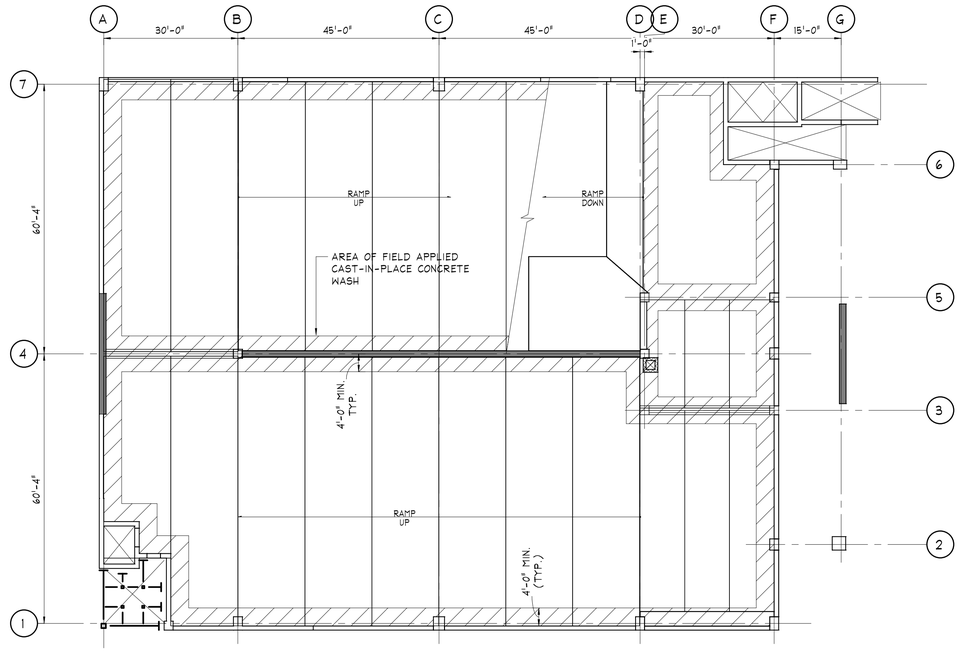
2) PROVIDE 6x6-W1.4xW1.4 WWF AT A MINIMUM IN ALL WASHES. WWF SHOULD BE FLAT, NOT ROLLED.

3) MINIMUM DIAPHRAGM REINFORCEMENT CAST IN THE WASHES SHALL BE AS SHOWN ON THIS PLAN.

4) LONGITUDINAL DIAPHRAGM REINFORCEMENT (PARALLEL TO SPAN OF DOUBLE TEE) SHALL BE CAST IN FLANGES OF DOUBLE TEE AS REQUIRED BY THE PRECAST MANUFACTURERS DESIGN.

5) CONNECTION OF DIAPHRAGM REINFORCEMENT (CAST IN FLANGE OF DOUBLE TEES OR LOOSE IN WASHES) TO ENSURE CONTINUITY BETWEEN DOUBLE TEES AND LOAD TRANSFER TO SHEAR WALLS SHALL BE PROVIDED BY THE PRECAST MFR.

6) ALL DIAPHRAGM REINFORCEMENT MUST BE CONTINUOUS, LAP PER GENERAL NOTES. COORDINATE w/ PRECAST MFR. AS REQUIRED WHERE ITEMS SUCH AS THE FOLLOWING ARE REQUIRED: SLEEVES THROUGH COLUMNS, CONNECTIONS TO PRECAST, OVERLAPPING WASHES AT STEPPED PRECAST, ETC.



SECOND TIER CAST-IN-PLACE WASH PLAN

SCALE: 1/16" = 1'-0"

NOTES:

1) PROVIDE 6x6-W1.4xW1.4 WWF AT A MINIMUM IN ALL WASHES. WWF SHOULD BE FLAT, NOT ROLLED. SEE DIAPHRAGM PLAN FOR ADDITIONAL REINF./INFO.

2) PROVIDE TOOLED CONTROL JOINTS (NOT SAW CUT) IN ALL CAST-IN-PLACE WASHES, SEE DETAILS THIS SHEET. TOOLED CONTROL JOINTS SHALL BE GREATER THAN 1" AND 1/4 OF SLAB DEPTH (DO NOT INTERRUPT MESH). CONTRACTOR TO SUBMIT SHOP DRAWING INDICATED TOOLED CONTROL JOINT PATTERN FOR REVIEW PRIOR TO CONSTRUCTION.

3) SEE ARCHITECTURAL DRAWINGS & SPECS FOR ALL WATERPROOFING AND SEALANT/CAULKING REQUIREMENTS.

4) ALL CAST-IN-PLACE WASH AND WEARING SLAB CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.

5) WASHES SHOWN ARE CONCEPTUAL ONLY FOR DRAINAGE; COORDINATE FINAL EXTENTS WITH PRECAST MANUFACTURER FOR LIMITATIONS OF TEES REQUIRED ADDITIONAL CAST-IN-PLACE TOPPING, ETC.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

SECOND TIER CIP WASH & DIAPHRAGM REINFORCEMENT PLANS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

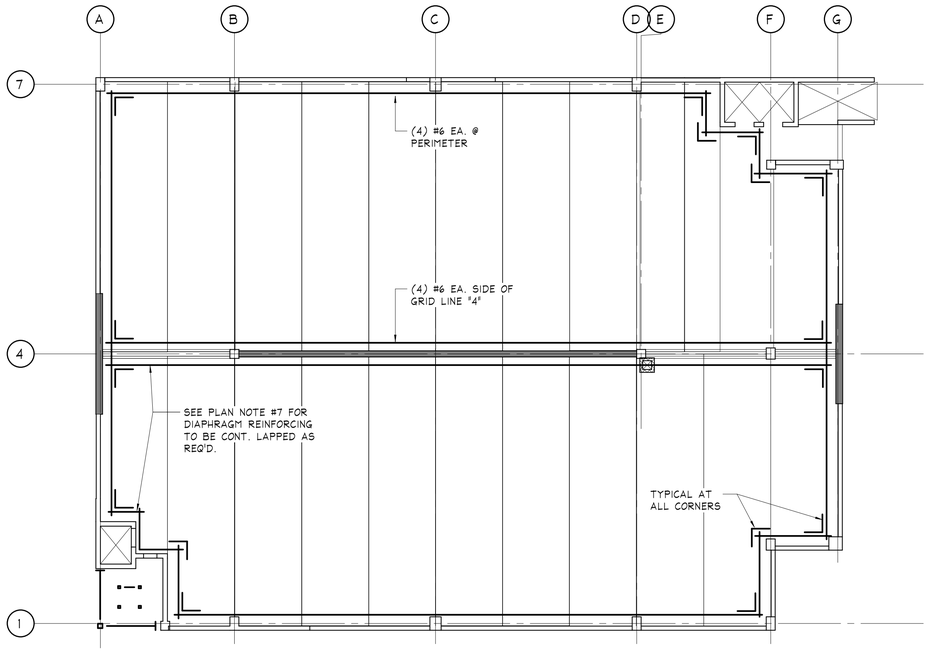
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

S-600



TYPICAL GARAGE FLOOR PLAN DIAPHRAGM REIFORCING

SCALE: 1/16" = 1'-0"

NOTES:

1) PROVIDE AT ALL LEVELS OF P/C GARAGE.

2) LAP ALL SPLICES PER GENERAL NOTES.

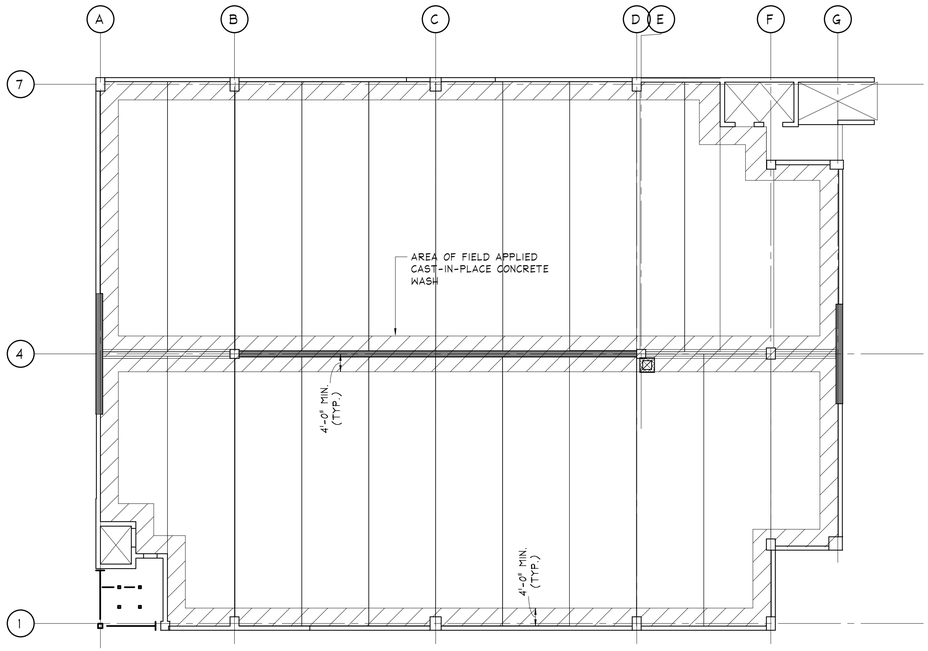
3) PROVIDE 6x6-W1.4xW1.4 WWF AT A MINIMUM IN ALL WASHES. WWF SHOULD BE FLAT, NOT ROLLED. SEE DIAPHRAGM PLAN FOR ADDITIONAL REINFORCING INFORMATION.

4) MIIMUM DIAPHRAGM REINFORCEMENT CAST IN THE WASHES SHALL BE AS SHOWN ON THIS PLAN.

5) LONGITUDINAL DIAPHRAGM REINFORCEMENT (PARALLEL TO SPAN OF DOUBLE TEE) SHALL BE CAST IN FLANGES OF DOUBLE TEE AS REQUIRED BY THE PRECAST MANUFACTURER'S DESIGN.

6) CONNECTION OF DIAPHRAGM REINFORCEMENT (CAST IN FLANGE OF DOUBLE TEE OR LOOSE IN WASHES) TO ENSURE CONTINUITY BETWEEN DOUBLE TEES AND LOAD TRANSFER TO SHEAR WALLS SHALL BE PROVIDED BY THE PRECAST MANUFACTURER.

7) ALL DIAPHRAGN REINFORCEMENT MUST BE CONTINUOUS, LAP PER GENERAL NOTES. COORDINATE w/ PRECAST MANFACTURER AS REQUIRED WHERE ITEMS SUCH AS THE FOLLOWING ARE REQUIRED: SLEEVES, THROUGH COLUMNS, CONNECTIONS TO PREACST, OVERLAPPING WASHES AT STEPPED PRECAST ETC.



TYPICAL GARAGE FLOOR CAST-IN-PLACE WASH PLAN

SCALE: 1/16" = 1'-0"

NOTES:

1) PROVIDE AT ALL LEVELS OF P/C GARAGE.

2) PROVIDE 6x6-W1.4xW1.4 WWF AT A MINIMUM IN ALL WASHES. WWF SHOULD BE FLAT, NOT ROLLED. SEE DIAPHRAGM PLAN FOR ADDITIONAL REINFORCING INFORMATION.

3) PROVIDE TOOLED CONTROL JOINTS (DO NOT SAW CUT) IN ALL CAST-IN-PLACE WASHES. SEE DETAILS THIS SHEET. TOOLED CONTROL JOINTS SHALL BE GREATER THAN 1" AND 1/4 OF SLAB DEPTH (DO NOT INTERRUPT MESH). CONTRACTOR TO SUBMIT SHOP DRAWINGS INDICATING CONTROL JOINT PATTERN FOR REVIEW PRIOR TO CONSTRUCTION.

4) SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR ALL WATERPROOFING AND SEALANT/CAULKING REQUIREMENTS

5) ALL CAST-IN-PLACE WASH AND WEARING SLAB CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.

6) WASHES SHOWN ARE CONCEPTUAL ONLY, FOR DRAINAGE, COORDINATE FINAL EXTENTS WITH PRECAST MANUFACTURER FOR LIMITATIONS OF TEES REQUIRED ADDITIONAL CAST-IN-PLACE TOPPING ETC.

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No. 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

TYPICAL CAST-IN-PLACE WASH & FLOOR DIAPHRAGM REINFORCING PLANS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

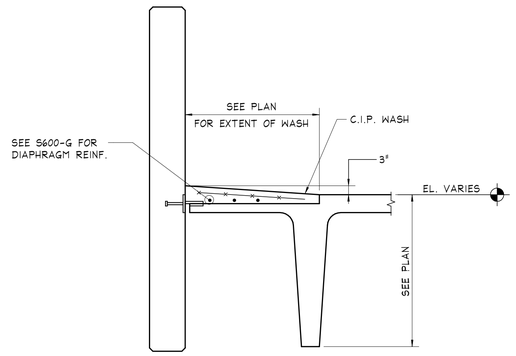
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

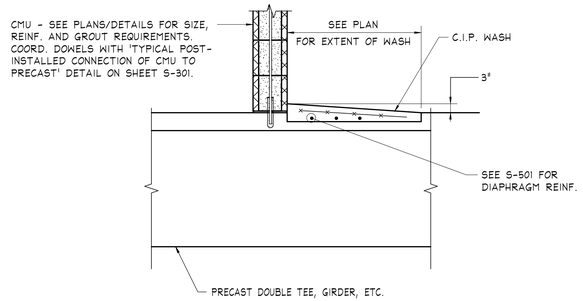
Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.

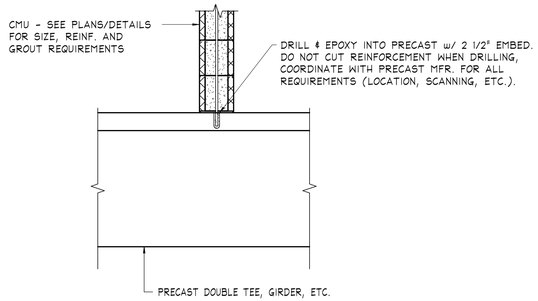
S-601



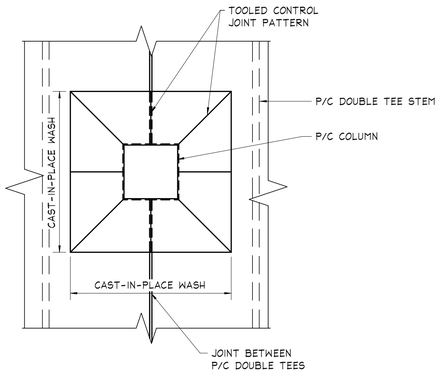
TYPICAL CIP WASH DETAIL



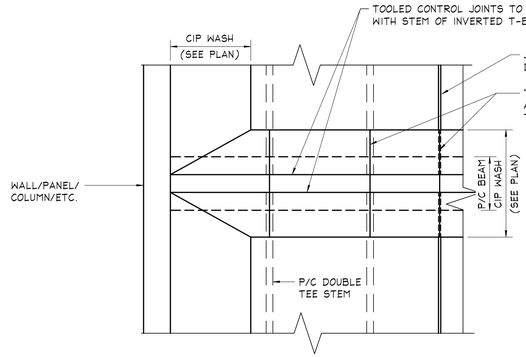
TYPICAL CAST-IN-PLACE WASH
AT CMU ON PRECAST DETAIL



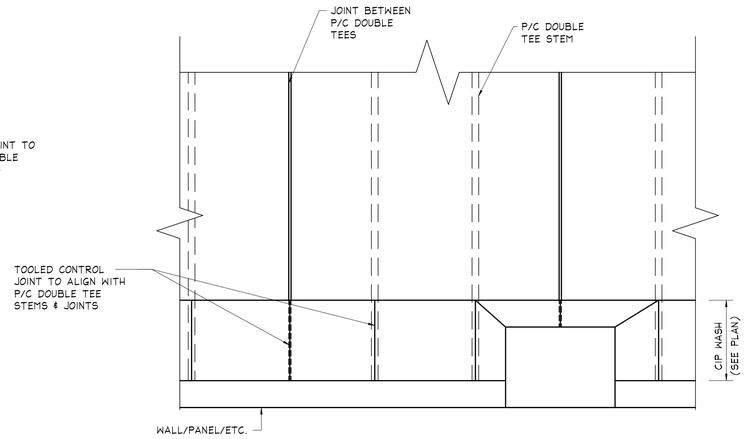
TYPICAL POST-INSTALLED
CONNECTION OF CMU TO PRECAST



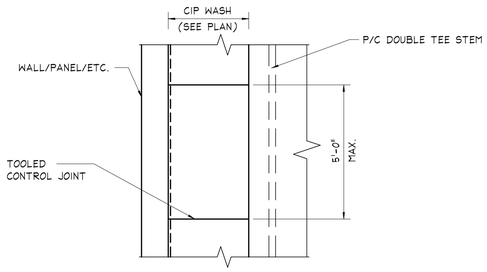
CIP WASH CONTROL JOINT PATTERN
@ ISOLATED COLUMN



CIP WASH CONTROL JOINT PATTERN
AT P/C GIRDERS



CIP WASH CONTROL JOINT PATTERN PERPENDICULAR
TO WALL/PANEL



CIP WASH CONTROL JOINT PATTERN
PARALLEL TO WALL/PANEL

ISSUED FOR BIDDING
7/28/2021

O'DONNELL & NACCARATO
STRUCTURAL ENGINEERS
1160 ROUTE 22 WEST | 2ND FLOOR | MOUNTAINSIDE NJ 07092
(908) 379-2911 | WWW.O-N.com | Project No.: 3823.0063.00

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

Paul Peter Panzarino, P.E. Date
N.J. Cert No. 42798

SHEET CONTENTS:

CIP WASH & DIAPHRAGM REINFORCEMENT DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING -H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUED FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS NOTED
Drawn by	MCP
Checked by	BJ
Job No.	2201565

Drawing No.
S-602

ABBREVIATIONS

AC	AIR CONDITIONING UNIT
ACR	AIR CURTAIN
AD	ACCESS DOOR
AF	AIRFOIL
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AMD	AIR MEASURING DEVICE
AP	ACCESS PANEL
AS	AIR SEPARATOR
ATC	AUTOMATIC TEMPERATURE CONTROL
B	BOILER
BAS	BUILDING AUTOMATION SYSTEM
BBD	BOILER BLOWDOWN
BD	BACKDRAFT DAMPER
BF	BOILER FEED UNIT
BFP	BACK FLOW PREVENTER
BFW	BOILER FEEDWATER
BFWP	BOILER FEEDWATER PUMP
BHP	BRAKE HORSEPOWER
BI	BACKWARD INCLINE
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STEEL
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BV	BUTTERFLY VALVE
℄	CENTER LINE
CBD	CONTINUOUS BOILER BLOWDOWN
CC	COOLING COIL
CD	CEILING DIFFUSER
CF	CHEMICAL FEED UNIT
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CON	CONCENTRIC
COND	CONDENSATE
CP	CONDENSATE PUMP
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CV	CONSTANT VOLUME / CONTROL VALVE
CW	COLD WATER
DA	DIRECT ACTING
DB	DRY BULB
DC	DUST COLLECTOR
DDC	DIRECT DIGITAL CONTROLS
DEH	DEHUMIDIFIER
DHWS/R	DOMESTIC HOT WATER SUPPLY / RETURN
DIA./ø	DIAMETER
DIFF	DIFFERENTIAL
DISCH	DISCHARGE
DL	DOOR LOUVER
DN	DOWN
DWDI	DOUBLE WIDTH DOUBLE INLET
DX	DIRECT EXPANSION
(E)	EXISTING TO REMAIN
EAT	ENTERING AIR TEMPERATURE
EBB	ELECTRIC BASEBOARD RADIATION
ECC	ECCENTRIC
EDH	ELECTRIC DUCT HEATER
EDR	EQUIVALENT DIRECT RADIATION
EF	EXHAUST FAN
EG	EXHAUST GRILLE
EJ	EXPANSION JOINT
EMCS	ENERGY MONITORING CONTROL SYSTEM
EP	ELECTRIC-PNEUMATIC
ER	EXHAUST REGISTER
ERU	ENERGY RECOVERY UNIT
ES	END SWITCH
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
(F)	FUTURE
FC	FORWARD CURVED OR FLEX CONN.
FCU	FAN COIL UNIT
FD	FLOOR DRAIN OR FIRE DAMPER
FH	FUME HOOD
FLA	FULL LOAD AMPS
FM	FLOW METER
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FRP	FIBERGLASS REINFORCED PIPE
FS	FLOW SWITCH
FT	FEET OR FLASH TANK
FT/WG	FEET WATER GAUGE
F&T	FLOAT & THERMOSTATIC TRAP
FTR	FINNED TUBE RADIATION
FV	FACE VELOCITY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRILLE
GV	GATE VALVE
H	HUMIDISTAT
HC	HEATING COIL
HD	HEAD
HX	HEAT EXCHANGER
HEPA	HIGH EFFICIENCY PARTICULATE ARRESTANCE FILTER
HOA	HAND-OFF AUTOMATIC SELECTOR SWITCH
HP	HORSEPOWER OR HEAT PUMP
HRU	HEAT RECOVERY UNIT
HUM	HUMIDITY OR HUMIDIFIER
HV	HEATING & VENTILATING UNIT
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
Hz	HERTZ
ID	INSIDE DIAMETER
IDU	INDOOR UNIT
I/L	INTERLOCK
IN	INCH
IN/WG	INCHES WATER GAUGE
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LR	LINEAR RETURN
LRA	LOCKED ROTOR AMPS
LVR	LOUVER
LWT	LEAVING WATER TEMPERATURE
MAU	MAKEUP AIR UNIT
MBH	1000 BTU PER HOUR
MOD	MOTOR OPERATED DAMPER
MU	MAKE UP WATER
(N)	NEW
NC	NORMALLY CLOSED
NG	NATURAL GAS
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAD	OUTSIDE AIR DAMPER
OAI	OUTSIDE AIR INTAKE
OBD	OPPOSED BLADE DAMPER
OCC	OCCUPIED
OD	OUTSIDE DIAMETER
OED	OPEN END DUCT
OV	OUTLET VELOCITY
P	PUMP
PBD	PARALLEL BLADE DAMPER
PD	PRESSURE DROP
PERF	PERFORATED
PH	PHASE
PRV	PRESSURE REDUCING VALVE
PSF	POUND PER SQUARE FOOT
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAUGE
PT	PRESSURE TRANSMITTER
PVC	POLYVINYL CHLORIDE
(R)	REMOVE EXISTING
RA	RETURN AIR OR REVERSE ACTING
RCP	RADIANT CEILING PANEL
RD	RETURN AIR DAMPER
(RE)	RELOCATE EXISTING
RE	RELIEF AIR/RELOCATE
REFR	REFRIGERANT
RF	RETURN AIR FAN
RG	RETURN AIR GRILLE
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RHG	REFRIGERANT HOT GAS
RL	REFRIGERANT LIQUID
RPM	REVOLUTIONS PER MINUTE
RR	RETURN AIR REGISTER
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
RV	REFRIGERANT VENT
SA	SUPPLY AIR
SD	SMOKE DETECTOR
SDA	SOUND ATTENUATOR
SEF	SMOKE EXHAUST FAN
SF	SUPPLY AIR FAN
SG	SUPPLY AIR GRILLE
SH	SENSIBLE HEAT
SP	STATIC PRESSURE
SQ FT	SQUARE FEET
STM	STEAM
SUCT	SUCTION
S/R	SUPPLY AND RETURN
T	THERMOSTAT
TAB	TESTING AND BALANCING
TAD	TRANSFER AIR DUCT
TF	TERMINAL AIR FILTER
TE	TOILET EXHAUST
TEMP	TEMPERATURE
TH	TOTAL HEAT
TOD	TOP OF DUCT
TOP	TOP OF PIPE
TOS	TOP OF STEEL
TP	TOTAL PRESSURE
TSP	TOTAL STATIC PRESSURE
TT	TEMPERATURE TRANSMITTER
UC	UNDERCUT
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UNOCC	UNOCCUPIED
UV	UNIT VENTILATOR
V	VENT OR VOLTS
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VACUUM BREAKER
VD	MANUAL VOLUME DAMPER
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VI	VIBRATION ISOLATOR
VIB	VIBRATION
VP	VACUUM PUMP
VTR	VENT THROUGH ROOF
WB	WET BULB
WC	WATER COLUMN
WG	WATER GAUGE
WMS	WIRE MESH SCREEN
XP	EXPLOSION PROOF

DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
	SUPPLY/OUTSIDE AIR DUCT
	RETURN/EXHAUST AIR DUCT
	45° ENTRY TAKEOFF, RECTANGULAR TO RECTANGULAR
	90° TAKEOFF, RECTANGULAR TO ROUND, STRAIGHT
	90° TAKEOFF, RECTANGULAR TO ROUND BELLMOUTH W/ MANUAL VOLUME DAMPER
	90° TAKEOFF, ROUND TO ROUND, STRAIGHT
	90° CONICAL TAKEOFF, ROUND TO ROUND
	45° CONICAL LATERAL, ROUND TO ROUND
	45° LATERAL, ROUND TO ROUND
	45° WYE, ROUND TO ROUND
	END OF DUCT (CAPPED)
FD	FIRE DAMPER – VERTICAL POSITION
	FIRE DAMPER – HORIZONTAL POSITION
	FLEXIBLE CONNECTION
	MANUAL VOLUME DAMPER
MOD	MOTOR OPERATED DAMPER
SD	SMOKE DETECTOR (DUCT-MOUNTED)
	RETURN/EXHAUST AIR DESIGNATION
	SUPPLY AIR DESIGNATION

MISC. DWG. SYMBOLS

	POINT OF CONNECTION
	POINT OF DISCONNECT
	POINT OF CONNECTION FOR FUTURE WORK
	EQUIPMENT SYMBOL
	EQUIPMENT NUMBER OR FLOW (GPM,CFM,ETC.)
	DETAIL NUMBER
	DETAIL DRAWING NUMBER
	SECTION NUMBER
	SECTION DRAWING NUMBER
	PLAN NUMBER
	PLAN DRAWING NUMBER
–	KEYED DEMOLITION NOTE
–	KEYED NEW WORK NOTE

CONTROLS

SYM. SYM. AUTOMATIC CONTROL DAMPER SYMBOLS:

OA = OUTSIDE AIR
RA = RETURN AIR
EA = EXHAUST AIR
RE = RELIEF AIR
BD = BACKDRAFT DAMPER
SA = SUPPLY AIR
SD = SMOKE DAMPER
FS = FIRE/SMOKE

T	THERMOSTAT – DUCT MOUNTED
T	THERMOSTAT – WALL MOUNTED
H	HUMIDISTAT – DUCT MOUNTED
H	HUMIDISTAT – WALL MOUNTED
FZ	FREEZESTAT (LOW TEMPERATURE DETECTOR)
SP	STATIC PRESSURE SENSOR – DUCT MOUNTED
SP	SPACE STATIC PRESSURE SENSOR
	AUTOMATIC CONTROL VALVE (2 – WAY)
	AUTOMATIC CONTROL VALVE (3 – WAY)
	SOLENOID VALVE
FS	FLOW SWITCH
CO2	CO2 SENSOR
CO	CO DETECTOR

PIPING SYMBOLS

SYMBOL	DESCRIPTION
	MANUAL BALANCING VALVE WITH PRESSURE TAPS SEE SPECIFICATIONS FOR TYPE
	BALL VALVE
	GATE VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	PLUG VALVE
	VACUUM BREAKER
	CHECK VALVE
	ANGLE SHUTOFF VALVE SEE SPECIFICATIONS FOR TYPE
	ANGLE BALANCING/SHUTOFF VALVE SEE SPECIFICATIONS FOR TYPE
	TRIPLE DUTY VALVE
	COMBINATION BALANCING/SHUTOFF VALVE W/PRESSURE TAPS
	PRESSURE REDUCING VALVE
	SAFETY/RELIEF VALVE – PLAN AND ELEVATION
	PUMP – GENERIC
	PUMP – END SUCTION
B	BASKET STRAINER – ELEVATION AND PLAN
	Y-STRAINER WITH PLUG
	Y-STRAINER WITH DRAIN VALVE
	PRESSURE GAUGE WITH GAUGE COCK
	THERMOMETER
P/T	PRESSURE/TEMPERATURE TEST FITTING
FM	FLOW METER
	PIPE UP AND DOWN
	TEE CONNECTION – STRAIGHT, DOWN, AND UP
	UNION
	END CAP
	BLIND FLANGE
	PIPE BELLOWS
	PIPE ANCHOR
	PIPE GUIDE (SLIDING)
	PIPE GUIDE (MOMENT)
	ELECTRICALLY HEAT TRACED PIPING
	AIR VENT – (MANUAL)
	AUTOMATIC AIR VENT
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
P R	PITCH OF PIPE, RISE (R) DROP (D)
W H	EXPANSION LOOP AND SIZE

LINE DESIGNATIONS

CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
G	NATURAL GAS
C	COIL CONDENSATE DRAIN
CF	CHEMICAL FEED
MU	MAKE UP WATER
BFW	BOILER FEED WATER
BBD	BOILER BLOWDOWN
CBD	CONTINUOUS BOILER BLOWDOWN
RV	REFRIGERANT VENT
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
	EXISTING PIPING/DUCTWORK TO REMAIN (WITH SERVICE DESIGNATION)
	EXISTING PIPING/DUCTWORK TO BE REMOVED (WITH SERVICE DESIGNATION)

GENERAL MECHANICAL NOTES

THE FOLLOWING NOTES APPLY TO ALL "M" MECHANICAL DRAWINGS:

1. ALL WORK SHALL FOLLOW THE INTERNATIONAL MECHANICAL CODE 2018, NJ EDITION.
2. ALL WORK CONTAINED WITHIN THE MECHANICAL DRAWINGS AND SPECIFICATIONS IS THE RESPONSIBILITY OF THE SINGLE PRIME CONTRACTOR UNLESS OTHERWISE NOTED.
3. NOT ALL SYMBOLS, ABBREVIATIONS AND LINE DESIGNATIONS ARE NECESSARILY USED ON THIS PROJECT.
4. ALL HVAC EQUIPMENT, DUCTWORK, PIPING, SUPPORTS AND ACCESSORY LOCATIONS AND ROUTING SHALL BE COORDINATED WITH ALL OTHER TRADES AND FIELD VERIFIED PRIOR TO INSTALLATION TO PROVIDE REQUIRED CLEARANCES FOR ALL OTHER SYSTEMS.
5. SUPPLY, RETURN AND EXHAUST AIR OPENING LOCATIONS AND SIZES FOR ROOF MOUNTED MECHANICAL EQUIPMENT ARE SHOWN FOR DUCTWORK ROUTING ONLY. THE MECHANICAL CONTRACTOR SHALL VERIFY THE ACTUAL SIZES OF DUCT CONNECTIONS AND THE REQUIRED ROOF OPENING SIZES FOR THE ROOF MOUNTED EQUIPMENT AND COORDINATE THE FINAL LOCATION OF ROOF PENETRATIONS WITH THE GENERAL CONTRACTOR.
6. THE CONTRACTOR PROVIDING MECHANICAL TRADE WORK SHALL INSTALL ALL ROOF MOUNTED MECHANICAL EQUIPMENT CURBS AND FLASHING AND COORDINATE WITH THE CONTRACTOR PROVIDING GENERAL TRADES PRIOR TO THE APPLICATION OF THE BUILDING ROOFING. THE CONTRACTOR PROVIDING MECHANICAL TRADE WORK SHALL ALSO INSTALL ALL NECESSARY ROOF CURB COUNTER-FLASHING TO ACHIEVE A WATERTIGHT ROOFING SEAL.
7. DUCTWORK MAINS AND BRANCHES ARE SHOWN DIAGRAMMATICALLY AND FOR DESIGN CLARITY AND AT THE ROOM LEVEL ROUTING AND ARRANGEMENT IS SHOWN TO MINIMIZE NOISE CARRYOVER FROM MECHANICAL EQUIPMENT AND ADJOINING SPACES. CONTRACTOR MAY PROPOSE REROUTING, OFFSETS, RISES AND DROPS AS NECESSARY TO CLEAR INSTALLED TRUSSES, JOISTS AND OTHER INTERFERENCES. FINAL DUCTWORK LAYOUT WILL BE APPROVED IN REQUIRED DUCTWORK SHOP DRAWING SUBMITTAL REVIEW PRIOR TO INSTALLATION. DEVIATIONS FROM APPROVED DUCTWORK SHOP DRAWING TO SUIT FIELD CONDITIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.
8. ALL PIPING/DUCTWORK/CONTROLS PENETRATING FIRE RATED PARTITIONS, WALLS AND CEILINGS SHALL BE SEALED ON BOTH SIDES USING AN APPROVED, UL LISTED FIRE SEALANT TO MATCH EXISTING WALL FIRE RATING. WHERE A PIPE/DUCT/CONTROL CONDUIT HAS BEEN REMOVED THAT PREVIOUSLY PENETRATED A FIRE RATED PARTITION, WALL OR CEILING, THE CONTRACTOR SHALL PATCH AND SEAL THE PENETRATION ON BOTH SIDES USING AN APPROVED, UL LISTED FIRE SEALANT TO MATCH EXISTING WALL FIRE RATING.
9. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR IN REGARDS TO THE DISCONNECT AND RECONNECT OF ALL EQUIPMENT BEING REMOVED AND/OR REPLACED IN-KIND AS INDICATED ON THE CONTRACT DOCUMENTS.
10. ELECTRICAL COORDINATION: CONTRACTOR PROVIDING MECHANICAL TRADE WORK SHALL COORDINATE VOLTAGES FOR EACH PIECE OF EQUIPMENT BEFORE PURCHASING EQUIPMENT WITH CONTRACTOR PROVIDING ELECTRICAL TRADE WORK.
11. CONTRACTOR COMPLETING CONTROLS INSTALLATION IS RESPONSIBLE FOR ALL POWER AND CONTROL WIRING (24V AND 120V) FOR A COMPLETE AND WORKING CONTROLS SYSTEM. COORDINATE TERMINATION POINTS AND AVAILABLE SPACE IN ELECTRICAL PANELS WITH CONTRACTOR COMPLETING ELECTRICAL WORK.
12. OWNER SHALL BE RESPONSIBLE FOR IDENTIFYING, TESTING, REMOVAL AND DISPOSAL OF ANY ASBESTOS AS REQUIRED UNDER THIS CONTRACT.
13. HVAC TESTING & BALANCING IS A PART OF THIS CONTRACT FOR ALL NEW EQUIPMENT INSTALLED UNDER THIS PROJECT. CONTRACTOR SHALL SUBMIT SIGNED AND SEALED TEST & BALANCE REPORTS, REFER TO PROJECT BOOK SPECIFICATIONS FOR DETAILS.
14. THE CONTRACTOR IS TO REPLACE ALL AIR-FILTERS AFTER COMPLETION OF CONSTRUCTION AND INITIAL TESTING OF HVAC SYSTEMS WITH NEW CLEAN FILTERS.
15. CONTRACTOR SHALL PROVIDE FLEXIBLE CONNECTIONS AT ALL DUCT CONNECTIONS TO EQUIPMENT. IF DUCT CONNECTION TO EQUIPMENT CANNOT BE MADE WITHOUT A HARD CONNECTION (E.G. MIXING BOX/FILTER RACK ASSEMBLY), CONTRACTOR SHALL PROVIDE FLEX CONNECTIONS FOR ALL DUCT CONNECTING WITH A HARD CONNECTION TO EQUIPMENT.
16. ALL EXISTING WALLS, CEILINGS, ROOF, FLOORS AND OTHER FINISHED SURFACES DAMAGED OR MODIFIED SHALL BE REPAIRED TO MATCH ADJACENT UNDISTURBED AREA. PATCH AND REPAIR SHALL MATCH EXISTING ADJACENT SURFACES AS TO THICKNESS, TEXTURE, MATERIALS AND COLOR. ALL ABANDONED OPENINGS SHALL BE PATCHED AND REPAIRED TO MATCH ADJACENT UNDISTURBED AREA AND ARCHITECTURE. ALL ROOF PENETRATIONS SHALL BE PERFORMED SUCH THAT WARRANTY IS MAINTAINED.
17. ALL NECESSARY STAGING AND MATERIAL STORAGE AREAS SHALL BE AS DIRECTED AND APPROVED BY THE OWNER.
18. ALL SYSTEMS THAT NEED TO BE DRAINED SHALL BE COORDINATED WITH THE OWNER.
19. ALL WORK SHALL BE PERFORMED TO NOT INTERFERE WITH THE NORMAL OPERATION OF THE FACILITIES. COORDINATE ANY NECESSARY SHUTDOWNS WITH THE FACILITY. MINIMIZE SHUTDOWNS TO LIMIT IMPACT OF INTERRUPTION OF COOLING, HEATING, DHW AND ELECTRICAL SERVICE TO THE FACILITY.
20. ALL MEANS OF EGRESS MUST BE KEPT FREE AND CLEAR OF ALL MATERIAL.
21. VERIFY ALL CONDITIONS, ELEVATIONS AND MEASUREMENTS SHOWN ON CONTRACT DRAWINGS. ALL DIMENSIONS AND ELEVATIONS FOR NEW AND EXISTING EQUIPMENT, PIPING AND APPARATUS ARE APPROXIMATE AND ARE ONLY FOR REFERENCE. SUBMIT SHOP DRAWINGS SHOWING ALL DIMENSIONS AND ELEVATIONS VERIFIED IN THE FIELD.
22. ALL INSTRUMENTS SHALL BE LOCATED TO PROVIDE EASY ACCESS AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
23. PROVIDE VALVED DRAINS ON ALL WATER PIPING SYSTEM LOW POINTS AND AS REQUIRED ON NEW EQUIPMENT. PROVIDE AIR VENTS AT PIPING SYSTEM HIGH POINTS AS REQUIRED FOR RELEASING AIR DURING STARTUP.
24. NO PIPING SMALLER THAN 3/4" EXCEPT AS NOTED.
25. PROVIDE WIRING AND RACEWAYS RELATED TO CONTROL OF MECHANICAL EQUIPMENT. RACEWAYS TO BE MINIMUM 3/4" RIGID CONDUIT; NO EXCEPTIONS.
26. PROVIDE MECHANICAL IDENTIFICATION FOR ALL EQUIPMENT, PIPING, DUCTWORK, VALVES, ETC., AS NOTED IN THE SPECIFICATIONS.
27. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING WALK-THROUGH OF SITE PRIOR TO SUBMITTING BID TO BE FAMILIAR WITH SITE CONDITIONS AND REQUIREMENTS.
28. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED CALCULATIONS (SIGNED AND SEALED BY AN ENGINEER LICENSED IN THE STATE OF NEW JERSEY) AND INSTALLATION INFORMATION TO SHOW COMPLIANCE WITH SEISMIC AND WIND FORCES IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE 2018, NJ EDITION. INFORMATION SHALL BE MADE AVAILABLE TO ENGINEER FOR REVIEW AND ALSO, MADE AVAILABLE UPON REQUEST FOR SUBMISSION TO CODE ENFORCEMENT. PROVIDE ALL SUPPORT SYSTEMS, SUPPLEMENTAL STEEL, ANCHORS, PIPE HANGERS AND ENGINEERING DOCUMENTATION NECESSARY TO PROVIDE A COMPLETE CODE COMPLIANT SYSTEM.

SCOPE OF WORK INFORMATION

SCOPE OF WORK INFORMATION:

1. BASIC PROJECT SCOPE:

1.1. ALL WORK CONTAINED WITHIN THE DRAWINGS AND SPECIFICATIONS IS THE RESPONSIBILITY OF THE CONTRACTOR, UNLESS OTHERWISE NOTED. REFER TO INDIVIDUAL DRAWING SHEETS AND SPECIFICATIONS FOR SPECIFIC REQUIREMENTS.

1.2. THE PROJECT SCOPE CONSISTS OF THE DEMOLITION OF THE EXISTING PARKING GARAGE AND ANNEX OFFICE BUILDING CONNECTOR BRIDGE INCLUDING THE REMOVAL AND DISCONNECTION OF ALL ITEMS REQUIRED TO SEPARATE THE EXISTING PARKING GARAGE FROM THE ANNEX OFFICE BUILDING. IN GENERAL, ALL MECHANICAL EQUIPMENT, DISTRIBUTION SYSTEMS AND APPURTENANCES AS NOTED SHALL BE DEMOLISHED AND REMOVED FROM THE PROJECT SITE IN ACCORDANCE WITH THE DOCUMENTS. THE NEW PARKING DECK WILL REQUIRE NEW MECHANICAL SYSTEMS, EQUIPMENT, DISTRIBUTION SYSTEMS AND CONTROLS AS NOTED WITHIN THE DOCUMENTS. ALL NEW EQUIPMENT AND SUB-SYSTEMS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND APPLICABLE CODES.

1.3. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.

1.4. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.

1.5. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE. IN ADDITION, COORDINATE ALL MECHANICAL DEMOLITION AND NEW WORK WITH PHASING NOTES ON ARCHITECTURAL DRAWING A-007.

1.6. REFER TO ARCHITECTURAL, CIVIL AND STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR SPECIFIC REQUIREMENTS OF THE RESPECTIVE TRADES.

1.7. REFER TO ELECTRICAL, PLUMBING AND FIRE PROTECTION DRAWINGS FOR SPECIFIC REQUIREMENTS OF THE RESPECTIVE TRADES.

1.8. REFER TO ENVIRONMENTAL DRAWINGS AND SPECIFICATIONS FOR ABATEMENT ACTIVITIES AND REQUIREMENTS.

DRAWING SHEET INDEX

UNION COUNTY PARKING GARAGE

SHEET NO.	DRAWING NUMBER	DRAWING TITLE	DATE	ISSUE	ISSUED FOR BIDDING	
		MECHANICAL				
1	M-001	MECHANICAL LEAD SHEET		X		
2	MD-100	MECHANICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN		X		
3	MD-101	MECHANICAL - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN		X		
4	MD-102	MECHANICAL - EXISTING GARAGE SECOND TO SIXTH FLOOR DEMOLITION PLAN		X		
5	MD-103	MECHANICAL - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN		X		
6	MD-104	MECHANICAL - EXISTING GARAGE ROOF DEMOLITION PLAN		X		
7	M-101	MECHANICAL - NEW GARAGE FIRST FLOOR PLAN		X		
8	M-101A	MECHANICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN		X		
9	M-102	MECHANICAL - NEW GARAGE SECOND FLOOR PLAN		X		
10	M-103	MECHANICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN		X		
11	M-104	MECHANICAL - NEW GARAGE EIGHTH FLOOR PLAN		X		
12	M-105	MECHANICAL - NEW GARAGE ROOF PLAN		X		
13	M-201	MECHANICAL - NEW GARAGE VRF PIPING DIAGRAM		X		
14	M-301	NEW GARAGE MECHANICAL SCHEDULES		X		
15	M-302	NEW GARAGE MECHANICAL SCHEDULES		X		
16	M-401	NEW GARAGE MECHANICAL DETAILS		X		

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL LEAD SHEET

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

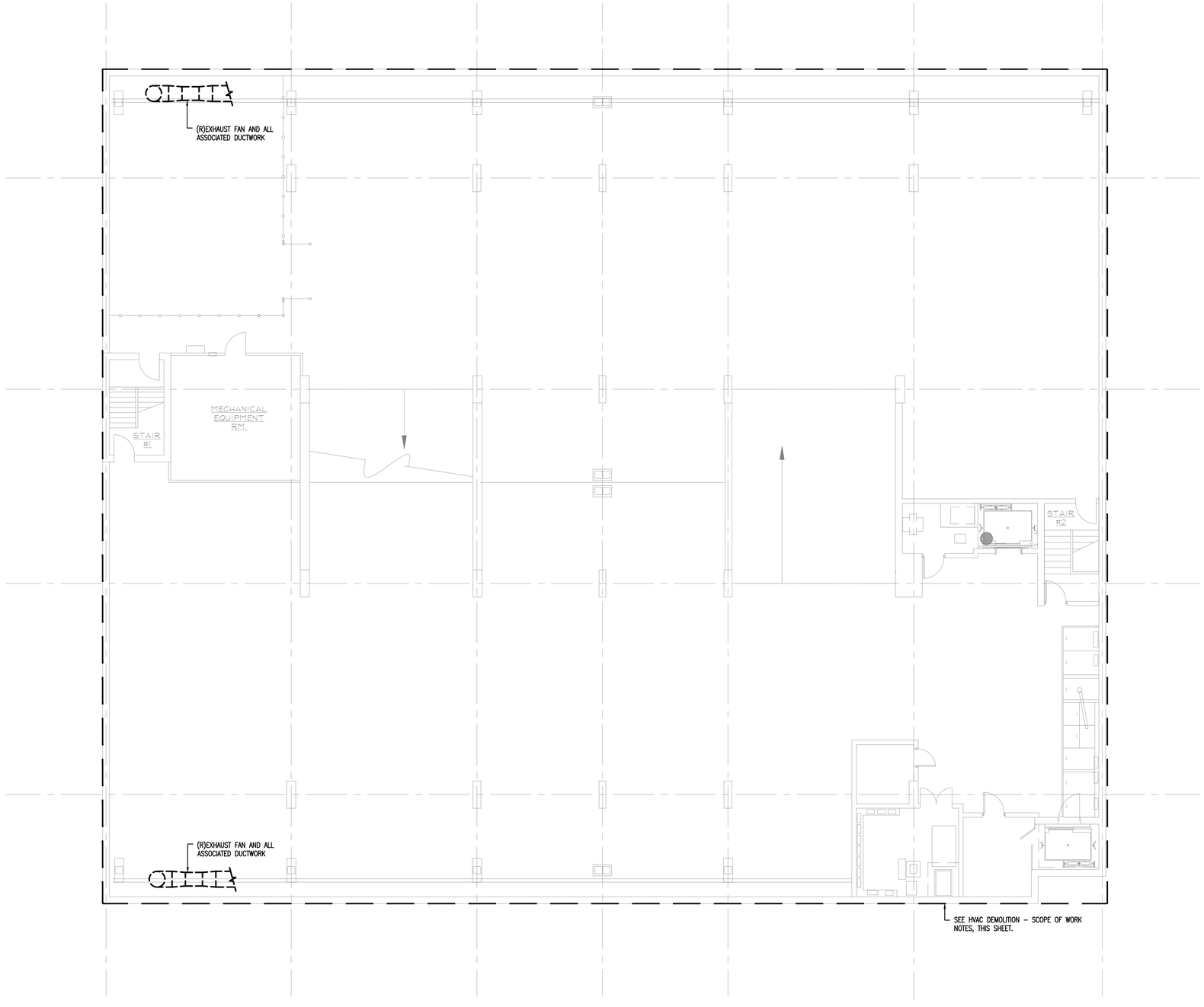
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-001

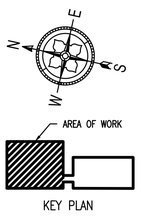


1 MD-100 **MECHANICAL – EXISTING GARAGE BASEMENT DEMOLITION PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"

MEPFP DEMOLITION NOTES:

1. GENERAL NOTES:
   - A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.
   - B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.
   - C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.
   - D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.
   - E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.
   - F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.
   - G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.
2. HVAC DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL VERIFY IN FIELD ALL MECHANICAL EQUIPMENT, PIPING SYSTEMS AND DUCT DISTRIBUTION SYSTEMS THAT ARE TO BE REMOVED PRIOR TO THE EXISTING PARKING GARAGE AND ANNEX BRIDGE DEMOLITION. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR THE DISPOSAL / REMOVAL OF ALL MECHANICAL EQUIPMENT. CONTRACTOR SHALL COMPILE A DETAILED RECORD OF EXISTING MECHANICAL EQUIPMENT TO BE REMOVED AND MAKE NOTATION AS TO CONDITION AND PROVIDE TO OWNER'S REPRESENTATIVE. OWNER SHALL MAKE FINAL DECISION ON DISPOSAL OR RETAINAGE OF MECHANICAL EQUIPMENT FOR OWNER USE ELSEWHERE.
   - B. CONTRACTOR SHALL REMOVE EXISTING MECHANICAL EQUIPMENT (ROOFTOP UNITS, UNIT HEATERS, SPLIT-SYSTEMS, SUPPLY AND/OR EXHAUST FANS AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT) LOCATED THROUGHOUT THE EXISTING PARKING GARAGE AND ANNEX BRIDGE UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE AFTER UTILITIES HAVE BEEN VERIFIED AS DISCONNECTED AND CAPPED. CONTRACTOR SHALL ISOLATE WITH ISOLATION VALVE AND CAP ANY PIPING (NATURAL GAS, HEATING HOT WATER, ETC.) TO ALLOW FOR THE MECHANICAL EQUIPMENT DEMOLITION AND THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED.
   - C. CONTRACTOR SHALL REMOVE OR CAP ALL EXISTING DUCTWORK WITHIN THE EXISTING GARAGE AT THE DIRECTION OF THE OWNER'S REPRESENTATIVE AND AS REQUIRED TO ALLOW FOR THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED. IF DUCTWORK REMOVAL IS REQUIRED, THEN REMOVE CORRESPONDING AIR DEVICES.
   - D. COORDINATE ALL MECHANICAL EQUIPMENT REMOVAL WITH OTHER TRADES SO THAT REMOVAL CAN BE COMPLETED IN A SAFE MANNER.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

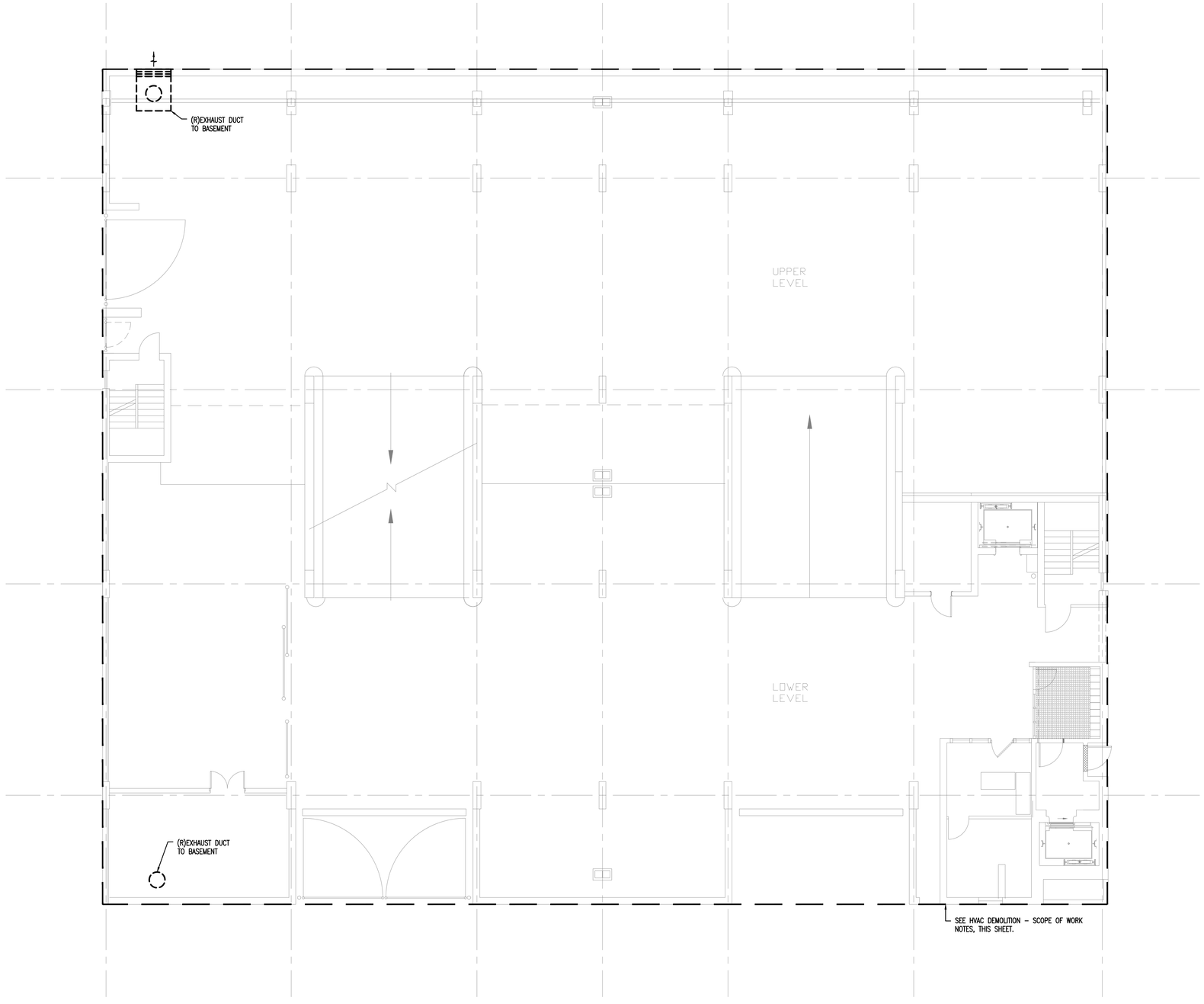
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

MD-100



1 MD-101 **MECHANICAL – EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"

MEPFP DEMOLITION NOTES:

1. GENERAL NOTES:

A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.

B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.

C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.

D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.

E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.

F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.

G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.

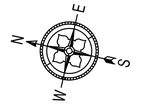
2. HVAC DEMOLITION – SCOPE OF WORK:

A. CONTRACTOR SHALL VERIFY IN FIELD ALL MECHANICAL EQUIPMENT, PIPING SYSTEMS AND DUCT DISTRIBUTION SYSTEMS THAT ARE TO BE REMOVED PRIOR TO THE EXISTING PARKING GARAGE AND ANNEX BRIDGE DEMOLITION. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR THE DISPOSAL / REMOVAL OF ALL MECHANICAL EQUIPMENT. CONTRACTOR SHALL COMPILE A DETAILED RECORD OF EXISTING MECHANICAL EQUIPMENT TO BE REMOVED AND MAKE NOTATION AS TO CONDITION AND PROVIDE TO OWNER'S REPRESENTATIVE. OWNER SHALL MAKE FINAL DECISION ON DISPOSAL OR RETAINAGE OF MECHANICAL EQUIPMENT FOR OWNER USE ELSEWHERE.

B. CONTRACTOR SHALL REMOVE EXISTING MECHANICAL EQUIPMENT (ROOFTOP UNITS, UNIT HEATERS, SPLIT-SYSTEMS, SUPPLY AND/OR EXHAUST FANS AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT) LOCATED THROUGHOUT THE EXISTING PARKING GARAGE AND ANNEX BRIDGE UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE AFTER UTILITIES HAVE BEEN VERIFIED AS DISCONNECTED AND CAPPED. CONTRACTOR SHALL ISOLATE WITH ISOLATION VALVE AND CAP ANY PIPING (NATURAL GAS, HEATING HOT WATER, ETC.) TO ALLOW FOR THE MECHANICAL EQUIPMENT DEMOLITION AND THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED.

C. CONTRACTOR SHALL REMOVE OR CAP ALL EXISTING DUCTWORK WITHIN THE EXISTING GARAGE AT THE DIRECTION OF THE OWNER'S REPRESENTATIVE AND AS REQUIRED TO ALLOW FOR THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED. IF DUCTWORK REMOVAL IS REQUIRED, THEN REMOVE CORRESPONDING AIR DEVICES.

D. COORDINATE ALL MECHANICAL EQUIPMENT REMOVAL WITH OTHER TRADES SO THAT REMOVAL CAN BE COMPLETED IN A SAFE MANNER.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

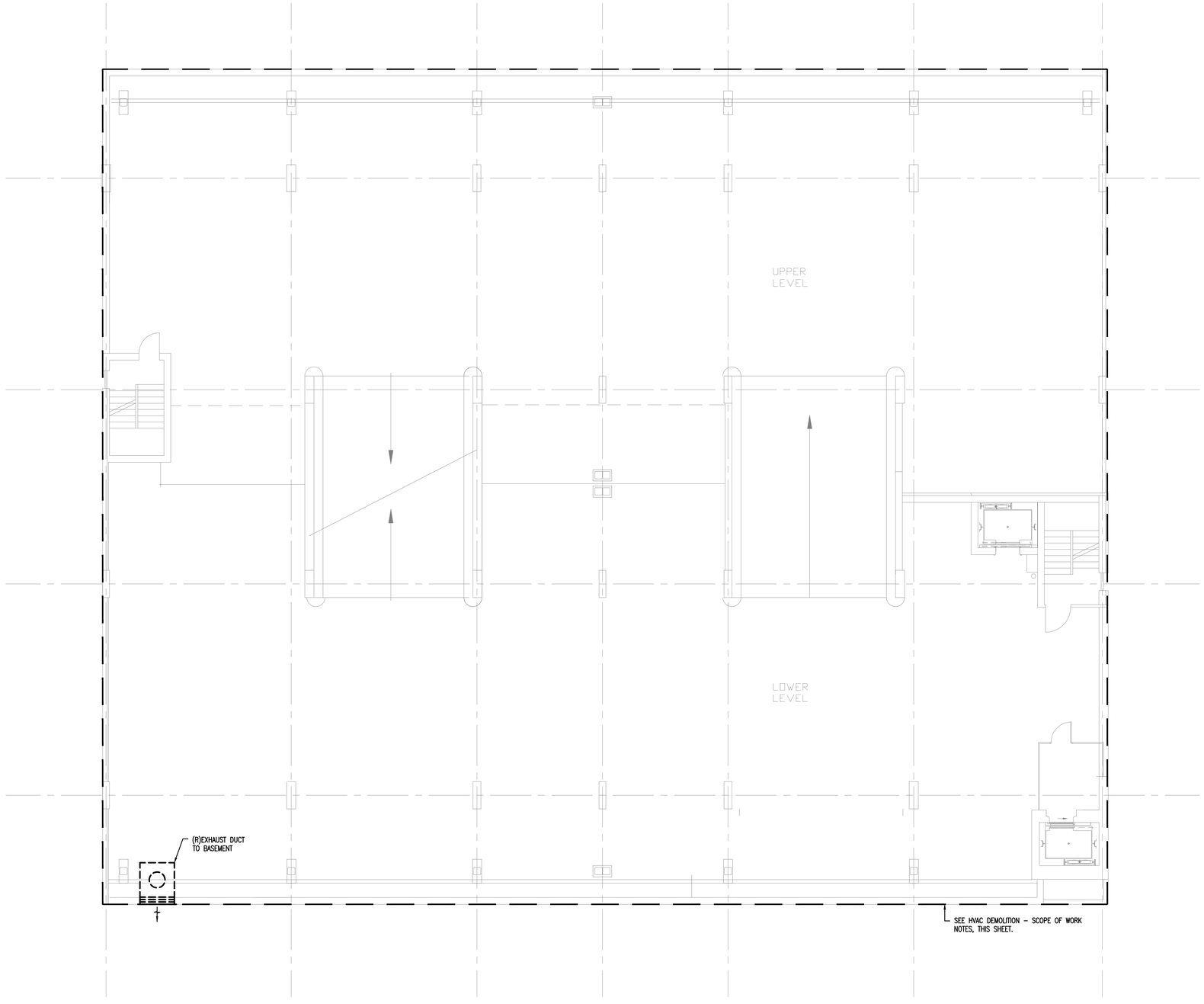
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

MD-101



1 / MD-102 MECHANICAL – EXISTING GARAGE SECOND TO SIXTH FLOOR DEMOLITION PLAN
SCALE: 1/8"=1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')

MEPFP DEMOLITION NOTES:

1. GENERAL NOTES:

A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.

B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.

C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.

D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.

E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.

F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.

G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.

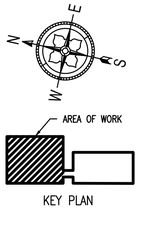
2. HVAC DEMOLITION – SCOPE OF WORK:

A. CONTRACTOR SHALL VERIFY IN FIELD ALL MECHANICAL EQUIPMENT, PIPING SYSTEMS AND DUCT DISTRIBUTION SYSTEMS THAT ARE TO BE REMOVED PRIOR TO THE EXISTING PARKING GARAGE AND ANNEX BRIDGE DEMOLITION. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR THE DISPOSAL / REMOVAL OF ALL MECHANICAL EQUIPMENT. CONTRACTOR SHALL COMPILE A DETAILED RECORD OF EXISTING MECHANICAL EQUIPMENT TO BE REMOVED AND MAKE NOTATION AS TO CONDITION AND PROVIDE TO OWNER'S REPRESENTATIVE. OWNER SHALL MAKE FINAL DECISION ON DISPOSAL OR RETAINAGE OF MECHANICAL EQUIPMENT FOR OWNER USE ELSEWHERE.

B. CONTRACTOR SHALL REMOVE EXISTING MECHANICAL EQUIPMENT (ROOFTOP UNITS, UNIT HEATERS, SPLIT-SYSTEMS, SUPPLY AND/OR EXHAUST FANS AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT) LOCATED THROUGHOUT THE EXISTING PARKING GARAGE AND ANNEX BRIDGE UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE AFTER UTILITIES HAVE BEEN VERIFIED AS DISCONNECTED AND CAPPED. CONTRACTOR SHALL ISOLATE WITH ISOLATION VALVE AND CAP ANY PIPING (NATURAL GAS, HEATING HOT WATER, ETC.) TO ALLOW FOR THE MECHANICAL EQUIPMENT DEMOLITION AND THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED.

C. CONTRACTOR SHALL REMOVE OR CAP ALL EXISTING DUCTWORK WITHIN THE EXISTING GARAGE AT THE DIRECTION OF THE OWNER'S REPRESENTATIVE AND AS REQUIRED TO ALLOW FOR THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED. IF DUCTWORK REMOVAL IS REQUIRED, THEN REMOVE CORRESPONDING AIR DEVICES.

D. COORDINATE ALL MECHANICAL EQUIPMENT REMOVAL WITH OTHER TRADES SO THAT REMOVAL CAN BE COMPLETED IN A SAFE MANNER.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - EXISTING GARAGE SECOND TO SIXTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

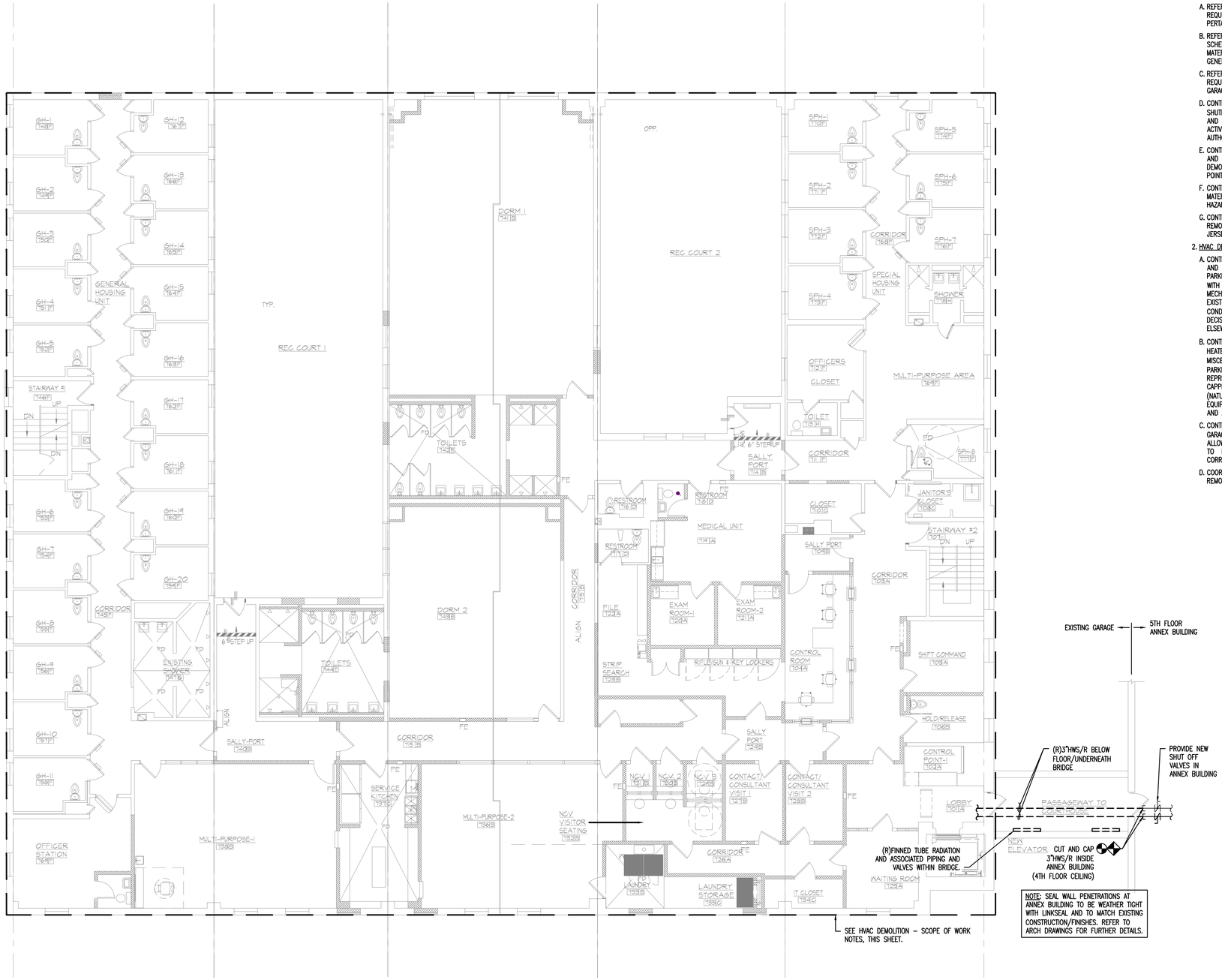
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

MD-102



1 / MD-103 **MECHANICAL – EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN**

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

MEPFP DEMOLITION NOTES:

1. GENERAL NOTES:

A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.

B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.

C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.

D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.

E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.

F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.

G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.

2. HVAC DEMOLITION – SCOPE OF WORK:

A. CONTRACTOR SHALL VERIFY IN FIELD ALL MECHANICAL EQUIPMENT, PIPING SYSTEMS AND DUCT DISTRIBUTION SYSTEMS THAT ARE TO BE REMOVED PRIOR TO THE EXISTING PARKING GARAGE AND ANNEX BRIDGE DEMOLITION. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR THE DISPOSAL / REMOVAL OF ALL MECHANICAL EQUIPMENT. CONTRACTOR SHALL COMPILE A DETAILED RECORD OF EXISTING MECHANICAL EQUIPMENT TO BE REMOVED AND MAKE NOTATION AS TO CONDITION AND PROVIDE TO OWNER'S REPRESENTATIVE. OWNER SHALL MAKE FINAL DECISION ON DISPOSAL OR RETAINAGE OF MECHANICAL EQUIPMENT FOR OWNER USE ELSEWHERE.

B. CONTRACTOR SHALL REMOVE EXISTING MECHANICAL EQUIPMENT (ROOFTOP UNITS, UNIT HEATERS, SPLIT-SYSTEMS, SUPPLY AND/OR EXHAUST FANS AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT) LOCATED THROUGHOUT THE EXISTING PARKING GARAGE AND ANNEX BRIDGE UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE AFTER UTILITIES HAVE BEEN VERIFIED AS DISCONNECTED AND CAPPED. CONTRACTOR SHALL ISOLATE WITH ISOLATION VALVE AND CAP ANY PIPING (NATURAL GAS, HEATING HOT WATER, ETC.) TO ALLOW FOR THE MECHANICAL EQUIPMENT DEMOLITION AND THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED.

C. CONTRACTOR SHALL REMOVE OR CAP ALL EXISTING DUCTWORK WITHIN THE EXISTING GARAGE AT THE DIRECTION OF THE OWNER'S REPRESENTATIVE AND AS REQUIRED TO ALLOW FOR THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED. IF DUCTWORK REMOVAL IS REQUIRED, THEN REMOVE CORRESPONDING AIR DEVICES.

D. COORDINATE ALL MECHANICAL EQUIPMENT REMOVAL WITH OTHER TRADES SO THAT REMOVAL CAN BE COMPLETED IN A SAFE MANNER.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

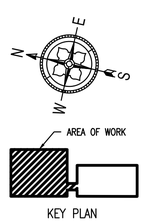
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

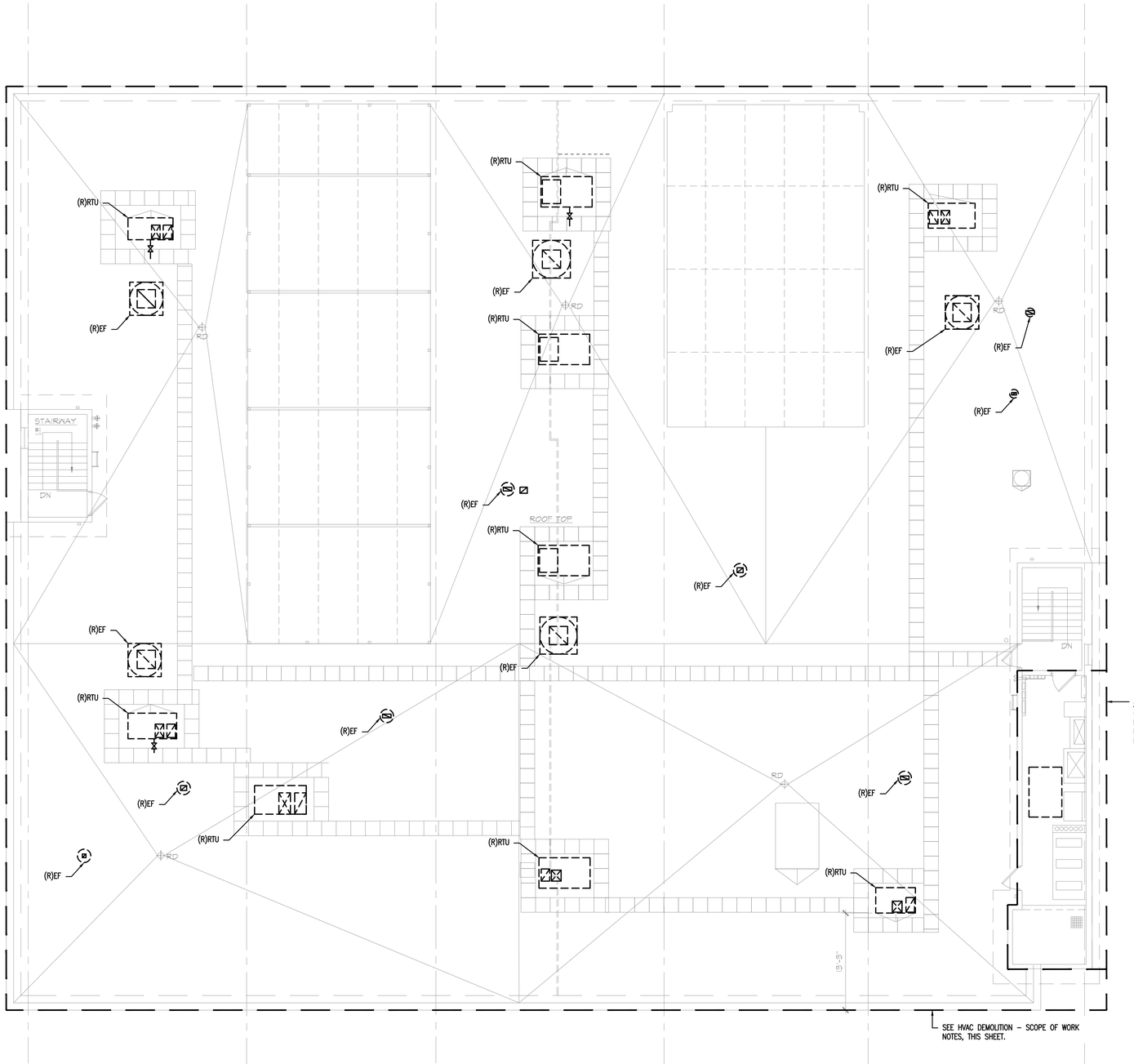
Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

MD-103

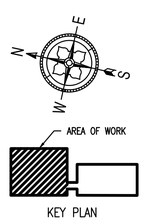


KEY PLAN



1 MD-104 **MECHANICAL – EXISTING GARAGE ROOF DEMOLITION PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

MEPFP DEMOLITION NOTES:

1. GENERAL NOTES:

A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.

B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.

C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.

D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.

E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.

F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.

G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.

2. HVAC DEMOLITION – SCOPE OF WORK:

A. CONTRACTOR SHALL VERIFY IN FIELD ALL MECHANICAL EQUIPMENT, PIPING SYSTEMS AND DUCT DISTRIBUTION SYSTEMS THAT ARE TO BE REMOVED PRIOR TO THE EXISTING PARKING GARAGE AND ANNEX BRIDGE DEMOLITION. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR THE DISPOSAL / REMOVAL OF ALL MECHANICAL EQUIPMENT. CONTRACTOR SHALL COMPILE A DETAILED RECORD OF EXISTING MECHANICAL EQUIPMENT TO BE REMOVED AND MAKE NOTATION AS TO CONDITION AND PROVIDE TO OWNER'S REPRESENTATIVE. OWNER SHALL MAKE FINAL DECISION ON DISPOSAL OR RETAINAGE OF MECHANICAL EQUIPMENT FOR OWNER USE ELSEWHERE.

B. CONTRACTOR SHALL REMOVE EXISTING MECHANICAL EQUIPMENT (ROOFTOP UNITS, UNIT HEATERS, SPLIT-SYSTEMS, SUPPLY AND/OR EXHAUST FANS AND OTHER MISCELLANEOUS MECHANICAL EQUIPMENT) LOCATED THROUGHOUT THE EXISTING PARKING GARAGE AND ANNEX BRIDGE UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE AFTER UTILITIES HAVE BEEN VERIFIED AS DISCONNECTED AND CAPPED. CONTRACTOR SHALL ISOLATE WITH ISOLATION VALVE AND CAP ANY PIPING (NATURAL GAS, HEATING HOT WATER, ETC.) TO ALLOW FOR THE MECHANICAL EQUIPMENT DEMOLITION AND THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED.

C. CONTRACTOR SHALL REMOVE OR CAP ALL EXISTING DUCTWORK WITHIN THE EXISTING GARAGE AT THE DIRECTION OF THE OWNER'S REPRESENTATIVE AND AS REQUIRED TO ALLOW FOR THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE TO BE COMPLETED. IF DUCTWORK REMOVAL IS REQUIRED, THEN REMOVE CORRESPONDING AIR DEVICES.

D. COORDINATE ALL MECHANICAL EQUIPMENT REMOVAL WITH OTHER TRADES SO THAT REMOVAL CAN BE COMPLETED IN A SAFE MANNER.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - EXISTING GARAGE ROOF DEMOLITION PLAN

PROJECT TITLE:

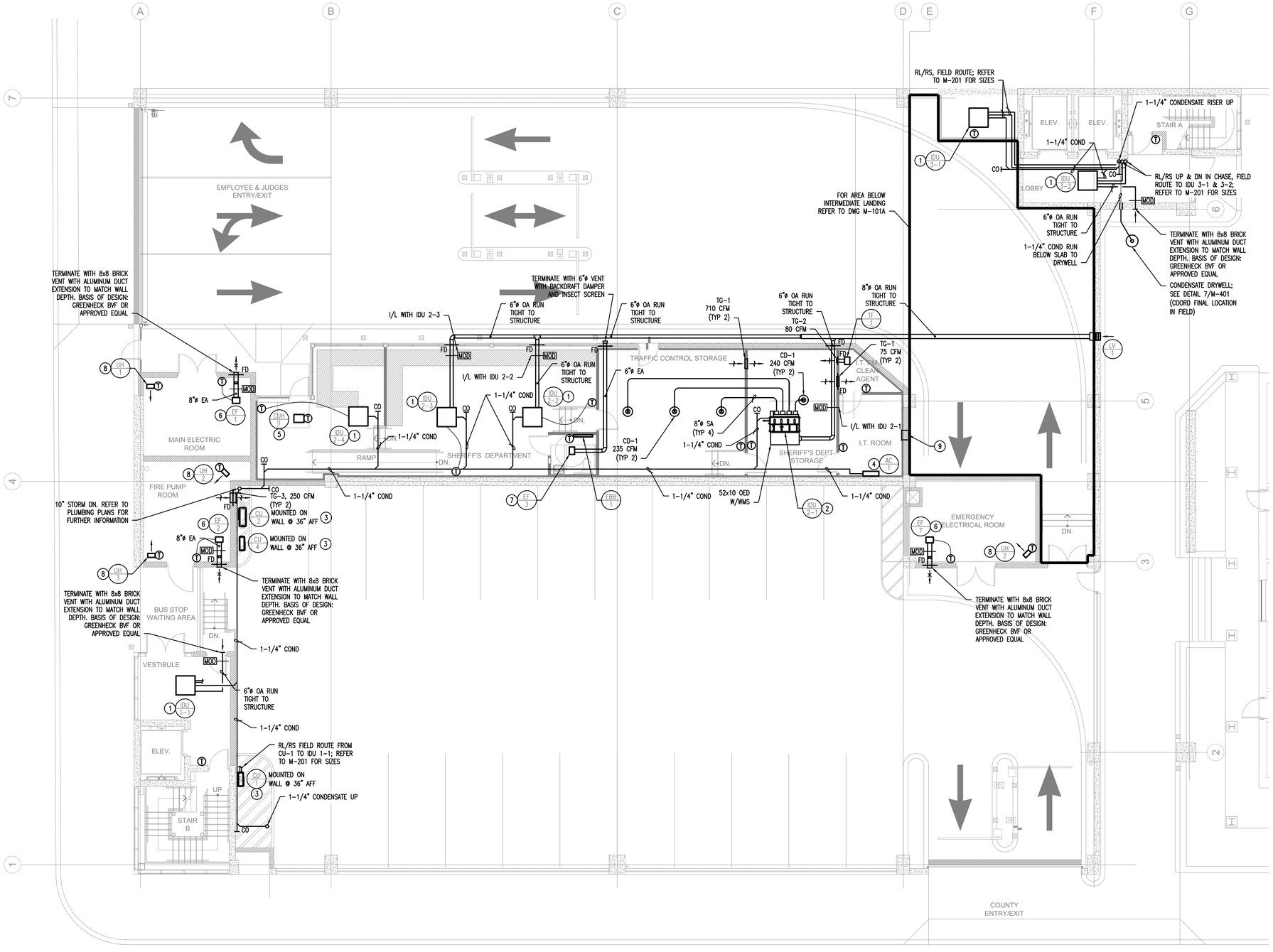
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
MD-104



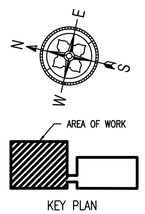
1 M-101 MECHANICAL – NEW GARAGE FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTE: GARAGE IS NATURALLY VENTILATED IN ACCORDANCE WITH IBC 2018, 406.5.2. REFER TO ARCHITECTURAL DRAWINGS FOR AREA CALCULATIONS.



KEY PLAN

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL CASSETTE-TYPE IDU IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN SCHEDULE AND SPECIFICATIONS. PROVIDE OUTSIDE AIR INTAKE KIT AND MOD. INTERLOCK MOD WITH IDU SUCH THAT THE MOD IS OPEN WHEN THE IDU OPERATES. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH SPRING VIBRATION ISOLATORS (BASIS OF DESIGN: VMC GROUP OR APPROVED EQUAL) WITH THREADED ROD HANGERS AND HARDWARE TO PROVIDE MIN 1" DEFLECTION. FURNISH AND INSTALL PROGRAMMABLE THERMOSTAT SUPPLIED BY EQUIPMENT VENDOR IN LOCATION AS INDICATED ON PLAN AT 48"AFF. SET THERMOSTAT AT 72°F WITH HEATING SETPOINT AT 70°F AND COOLING SETPOINT AT 74°F.

(2) CONTRACTOR SHALL FURNISH AND INSTALL DUCTED IDU IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER SUPPLIED ZONING KIT. UNIT AND DUCTWORK SHALL BE MOUNTED TIGHT TO STRUCTURE. PROVIDE WITH SPRING VIBRATION ISOLATORS (BASIS OF DESIGN: VMC GROUP OR APPROVED EQUAL) WITH THREADED ROD HANGERS AND HARDWARE TO PROVIDE MIN 1" DEFLECTION. FURNISH AND INSTALL PROGRAMMABLE THERMOSTAT SUPPLIED BY EQUIPMENT VENDOR IN LOCATION AS INDICATED ON PLAN AT 48"AFF. SET THERMOSTAT AT 72°F WITH HEATING SETPOINT AT 70°F AND COOLING SETPOINT AT 74°F.

(3) CONTRACTOR SHALL FURNISH AND INSTALL CONDENSING UNIT IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER'S WALL BRACKET. CONDENSING UNIT SHALL BE LOCATED 36" AFF TO BOTTOM OF UNIT. COORDINATE REFRIGERANT ROUTE WITH MANUFACTURER AND SUBMIT TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION. ALL REFRIGERANT SIZING SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS. CONTRACTOR SHALL FURNISH AND INSTALL POWER AND CONTROL WIRING BETWEEN CONDENSING UNIT AND INDOOR UNIT(S) PER MANUFACTURER REQUIREMENTS TO PROVIDE A COMPLETE AND WORKING SYSTEM.

(4) CONTRACTOR SHALL FURNISH AND INSTALL WALL MOUNTED AC UNIT IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE UNIT WITH DIAPHRAGM STYLE CONDENSATE PUMP AND ROUTE AS INDICATED ON PLAN.

(5) CONTRACTOR SHALL FURNISH AND INSTALL CABINET UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE WITH INTEGRAL THERMOSTAT SET AT 70°F (ADJUSTABLE). COORDINATE FINAL LOCATION FOR CUH WITH ARCHITECTURAL REFLECTED CEILING PLAN.

(6) CONTRACTOR SHALL FURNISH AND INSTALL EXHAUST FAN IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH MOD AND INTERLOCK MOD WITH FAN SUCH THAT MOD IS OPEN WHEN FAN OPERATES. PROVIDE LINE VOLTAGE THERMOSTAT IN LOCATION AS SHOWN. THERMOSTAT SHALL INDEX THE FAN ON UPON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT (90°F, ADJUSTABLE).

(7) CONTRACTOR SHALL FURNISH AND INSTALL EXHAUST FAN IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH MOD AND INTERLOCK MOD WITH FAN SUCH THAT MOD IS OPEN WHEN FAN OPERATES.

(8) CONTRACTOR SHALL FURNISH AND INSTALL UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER WALL BRACKET AND MOUNT UNITS AT 8'-0" AFF. PROVIDE WITH INTEGRAL THERMOSTAT SET AT 65°F (ADJ).

(9) DELEGATED DESIGN: PRESSURE RELIEF VENT FOR CLEAN AGENT SYSTEM SHALL BE DESIGNED IN CONJUNCTION WITH THE CLEAN AGENT SYSTEM. CLEAN AGENT SYSTEM DESIGNER SHALL CALCULATE PEAK PRESSURE AND RELIEF QUANTITY REQUIRED. MECHANICAL CONTRACTOR SHALL INSTALL VENT PER MANUFACTURER'S INSTRUCTIONS.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE FIRST FLOOR PLAN

PROJECT TITLE:

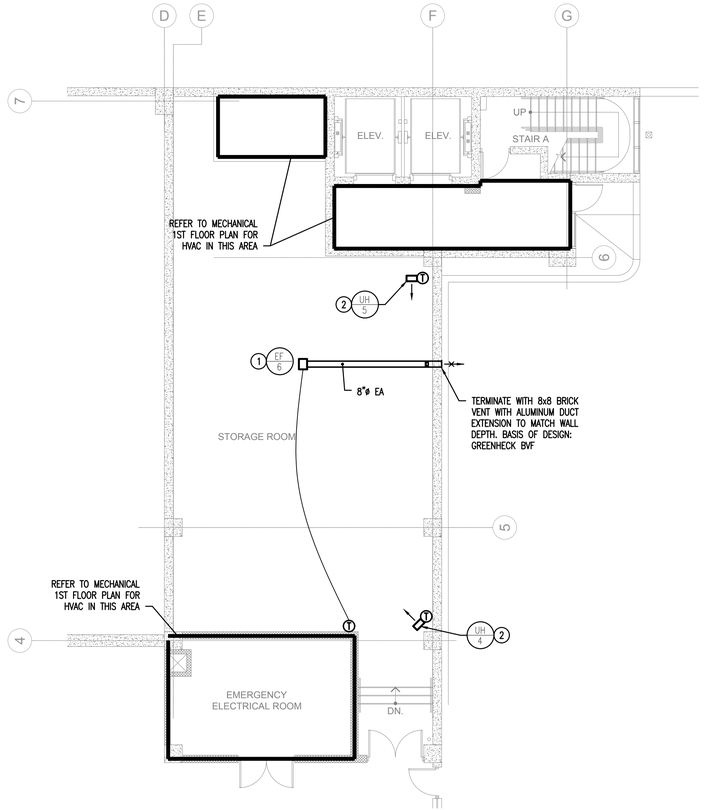
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
M-101



1 / M-101A MECHANICAL – NEW GARAGE PARTIAL FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

   A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

   B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

   C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

   D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

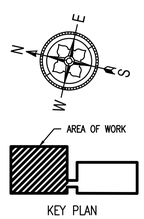
   E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL EXHAUST FAN IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH MOD AND INTERLOCK MOD WITH FAN SUCH THAT MOD IS OPEN WHEN FAN OPERATES. PROVIDE LINE VOLTAGE THERMOSTAT IN LOCATION AS SHOWN. THERMOSTAT SHALL INDEX THE FAN ON UPON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT (90°F, ADJUSTABLE).

(2) CONTRACTOR SHALL FURNISH AND INSTALL UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER WALL BRACKET AND MOUNT UNITS AT 8'-0" AFF. PROVIDE WITH INTEGRAL THERMOSTAT SET AT 65°F (ADJUSTABLE).



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

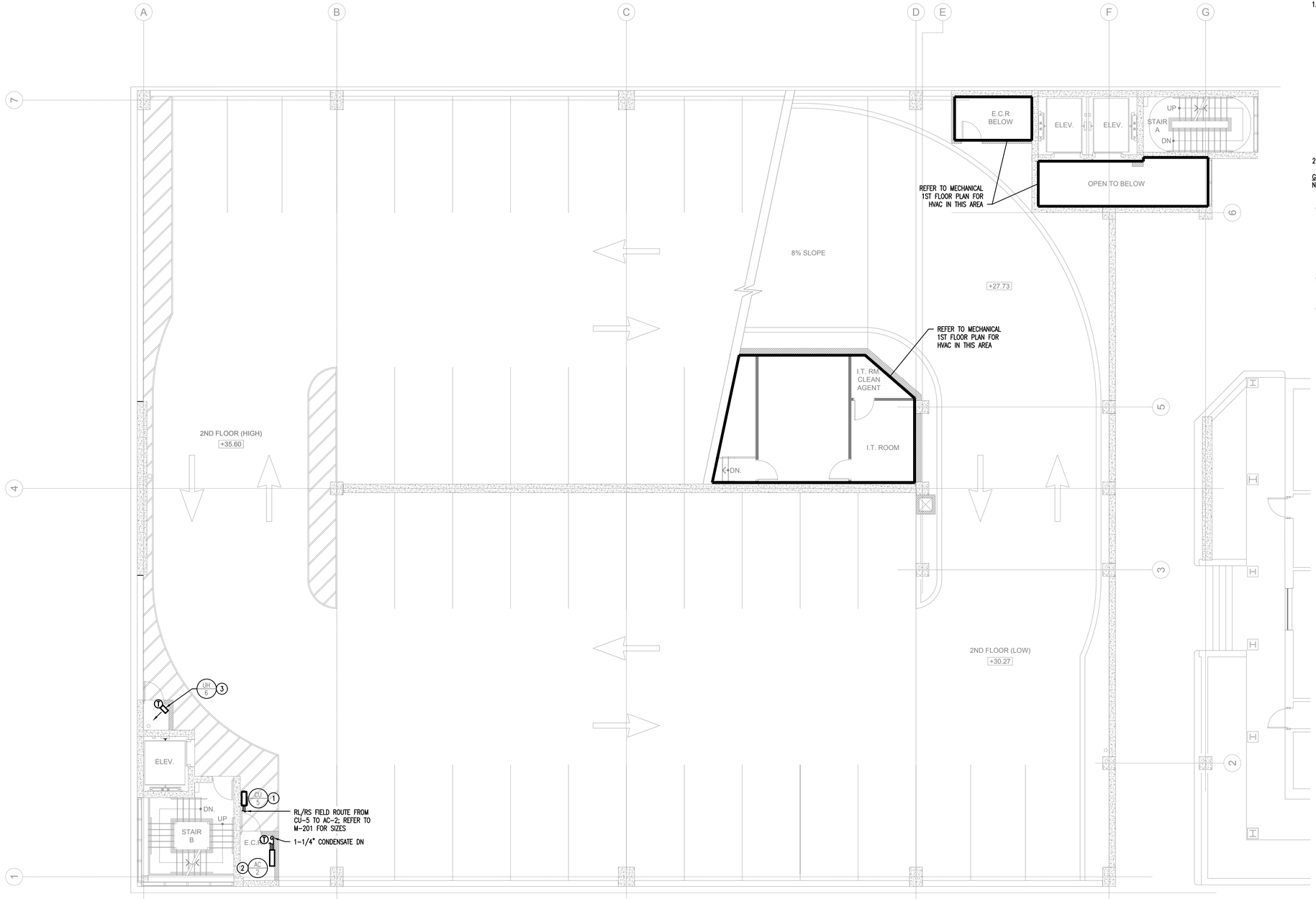
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-101A



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

   A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

   B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

   C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

   D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

   E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL CONDENSING UNIT IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER'S WALL BRACKET. CONDENSING UNIT SHALL BE LOCATED 36" AFF TO BOTTOM OF UNIT. COORDINATE REFRIGERANT ROUTE WITH MANUFACTURER AND SUBMIT TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION. ALL REFRIGERANT SIZING SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS. CONTRACTOR SHALL FURNISH AND INSTALL POWER AND CONTROL WIRING BETWEEN CONDENSING UNIT AND INDOOR UNIT PER MANUFACTURER'S REQUIREMENTS TO PROVIDE A COMPLETE AND WORKING SYSTEM.

(2) CONTRACTOR SHALL FURNISH AND INSTALL WALL MOUNTED AC UNIT IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE UNIT WITH DIAPHRAGM STYLE CONDENSATE PUMP AND ROUTE TO NEAREST STORM DRAIN.

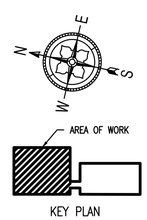
(3) CONTRACTOR SHALL FURNISH AND INSTALL UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER WALL BRACKET AND MOUNT UNITS AT 8'-0" AFF. PROVIDE WITH INTEGRAL THERMOSTAT SET AT 65°F (ADJUSTABLE).

1 / M-102 MECHANICAL – NEW GARAGE SECOND FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: GARAGE IS NATURALLY VENTILATED IN ACCORDANCE WITH IBC 2018, 406.5.2. REFER TO ARCHITECTURAL DRAWINGS FOR AREA CALCULATIONS.

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE SECOND FLOOR PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

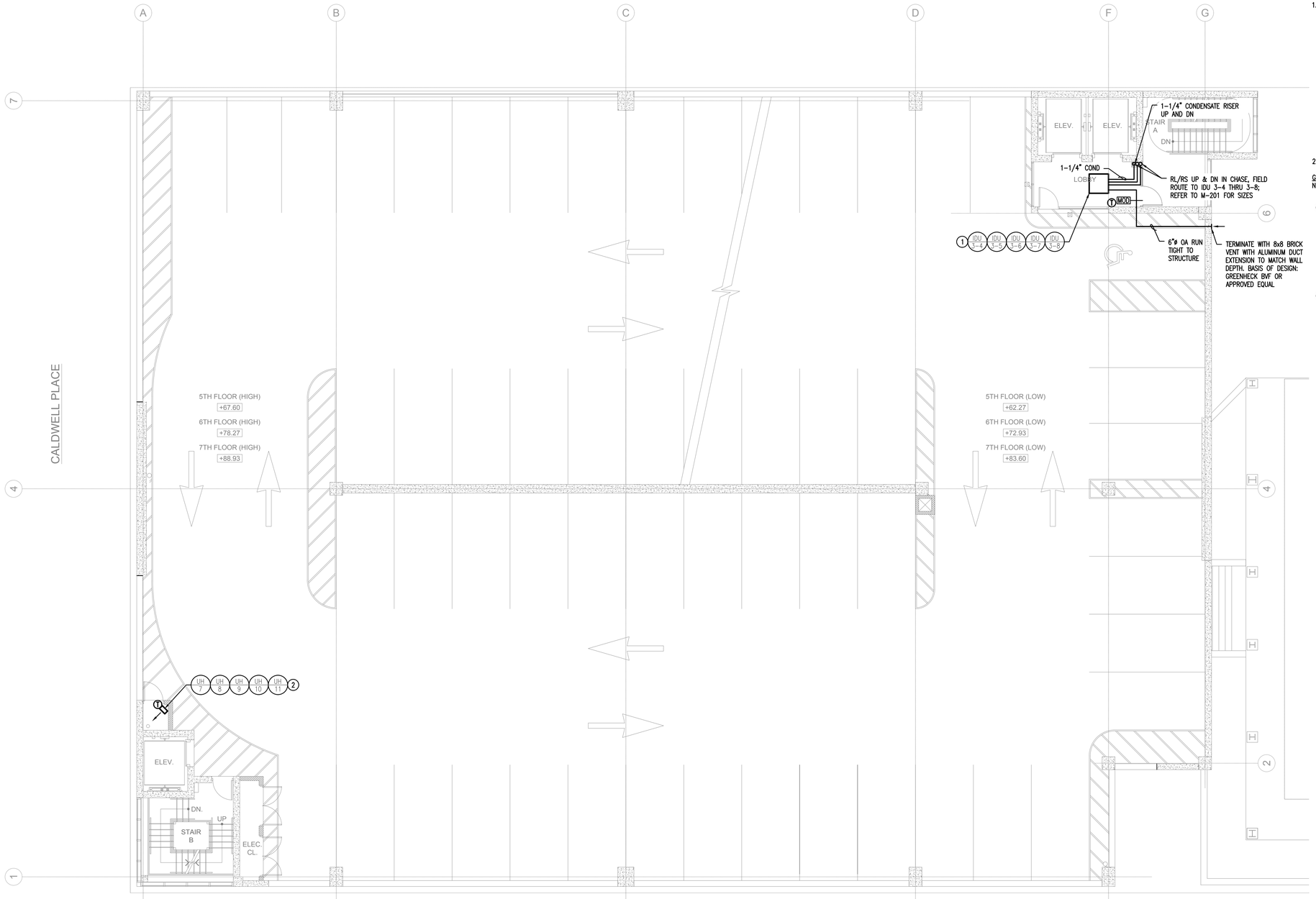
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-102



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

   A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

   B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

   C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

   D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

   E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (−) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL CASSETTE-TYPE IDU IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN SCHEDULE AND SPECIFICATIONS. PROVIDE OUTSIDE AIR INTAKE KIT AND MOD. INTERLOCK MOD WITH IDU SUCH THAT THE MOD IS OPEN WHEN THE IDU OPERATES. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH SPRING VIBRATION ISOLATORS (BASIS OF DESIGN: VMC GROUP OR APPROVED EQUAL) WITH THREADED ROD HANGERS AND HARDWARE TO PROVIDE MIN 1" DEFLECTION. FURNISH AND INSTALL PROGRAMMABLE THERMOSTAT SUPPLIED BY EQUIPMENT VENDOR IN LOCATION AS INDICATED ON PLAN AT 48"AFF. SET THERMOSTAT AT 72°F WITH HEATING SETPOINT AT 70°F AND COOLING SETPOINT AT 74°F.

(2) CONTRACTOR SHALL FURNISH AND INSTALL UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER WALL BRACKET AND MOUNT UNITS AT 8'-0" AFF. PROVIDE WITH INTEGRAL THERMOSTAT SET AT 65°F (ADJUSTABLE).

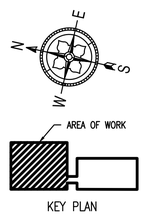
1 M-103 MECHANICAL – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: GARAGE IS NATURALLY VENTILATED IN ACCORDANCE WITH IBC 2018, 406.5.2. REFER TO ARCHITECTURAL DRAWINGS FOR AREA CALCULATIONS.

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

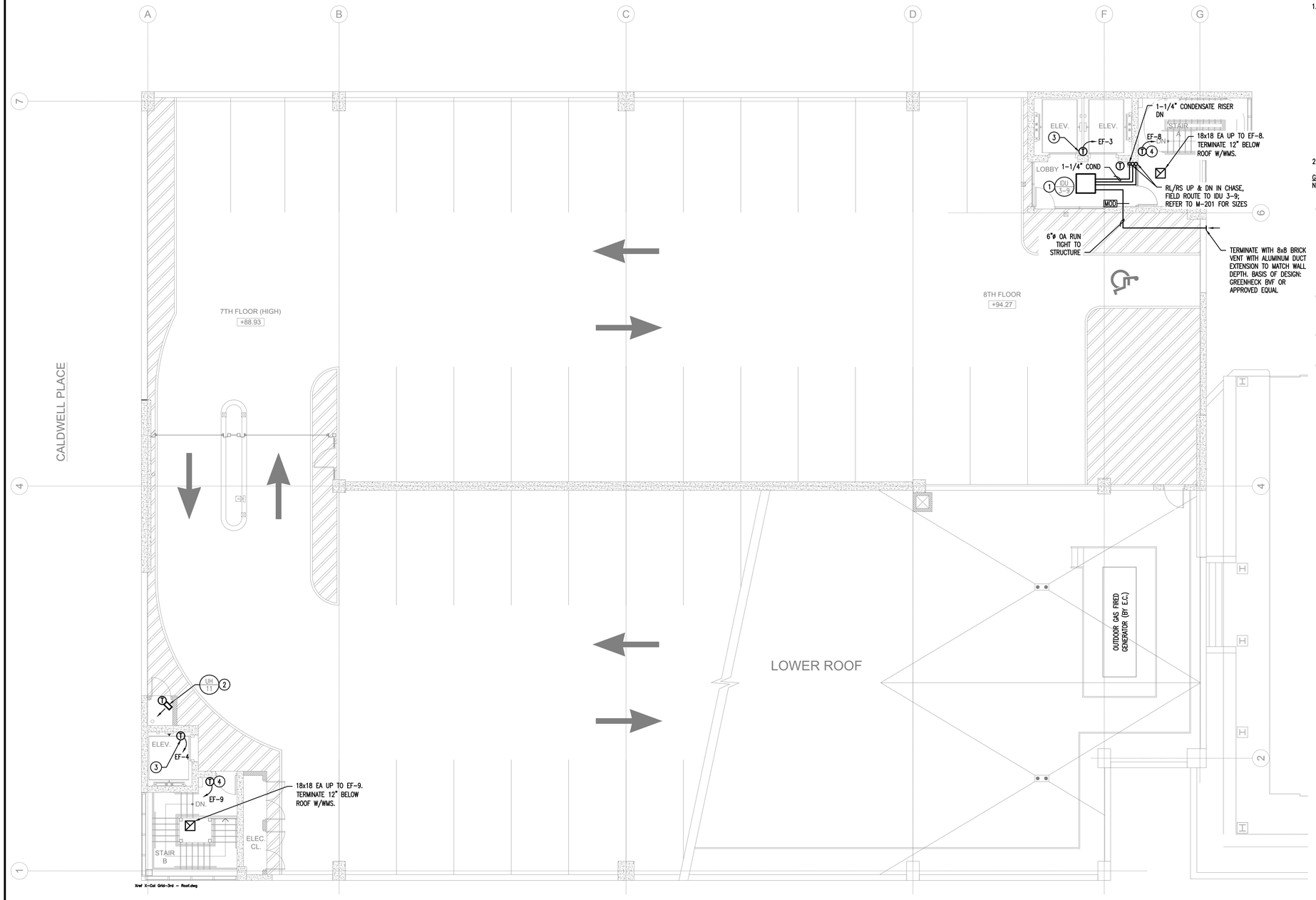
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-103



ELIZABETHTOWN PLAZA

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

   A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

   B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

   C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

   D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

   E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL CASSETTE-TYPE IDU IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN SCHEDULE AND SPECIFICATIONS. PROVIDE OUTSIDE AIR INTAKE KIT AND MOD. INTERLOCK MOD WITH IDU SUCH THAT THE MOD IS OPEN WHEN THE IDU OPERATES. COORDINATE FINAL LOCATION WITH ARCHITECTURAL REFLECTED CEILING PLAN. PROVIDE WITH SPRING VIBRATION ISOLATORS (BASIS OF DESIGN: VMC GROUP OR APPROVED EQUAL) WITH THREADED ROD HANGERS AND HARDWARE TO PROVIDE MIN 1" DEFLECTION. FURNISH AND INSTALL PROGRAMMABLE THERMOSTAT SUPPLIED BY EQUIPMENT VENDOR IN LOCATION AS INDICATED ON PLAN AT 48"AFF. SET THERMOSTAT AT 72°F WITH HEATING SETPOINT AT 70°F AND COOLING SETPOINT AT 74°F.

(2) CONTRACTOR SHALL FURNISH AND INSTALL UNIT HEATER IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. PROVIDE MANUFACTURER WALL BRACKET AND MOUNT UNITS AT 8'-0" AFF. PROVIDE INTEGRAL THERMOSTAT SET AT 65°F (ADJUSTABLE).

(3) MOUNT THERMOSTAT IN SUITABLE LOCATION NEAR THE TOP OF THE ELEVATOR SHAFT. THERMOSTAT SHALL ENERGIZE ASSOCIATED EXHAUST FAN UPON A RISE IN TEMPERATURE ABOVE SETPOINT (85°F, ADJUSTABLE)

(4) MOUNT THERMOSTAT AT THE TOP FLOOR OF THE STAIRWELL. THERMOSTAT SHALL ENERGIZE ASSOCIATED EXHAUST FAN UPON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT (85°F, ADJUSTABLE).

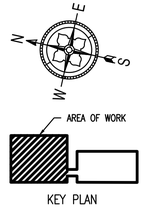
(1) M-104 MECHANICAL – NEW GARAGE EIGHTH FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: GARAGE IS NATURALLY VENTILATED IN ACCORDANCE WITH IBC 2018, 406.5.2. REFER TO ARCHITECTURAL DRAWINGS FOR AREA CALCULATIONS.

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE EIGHTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

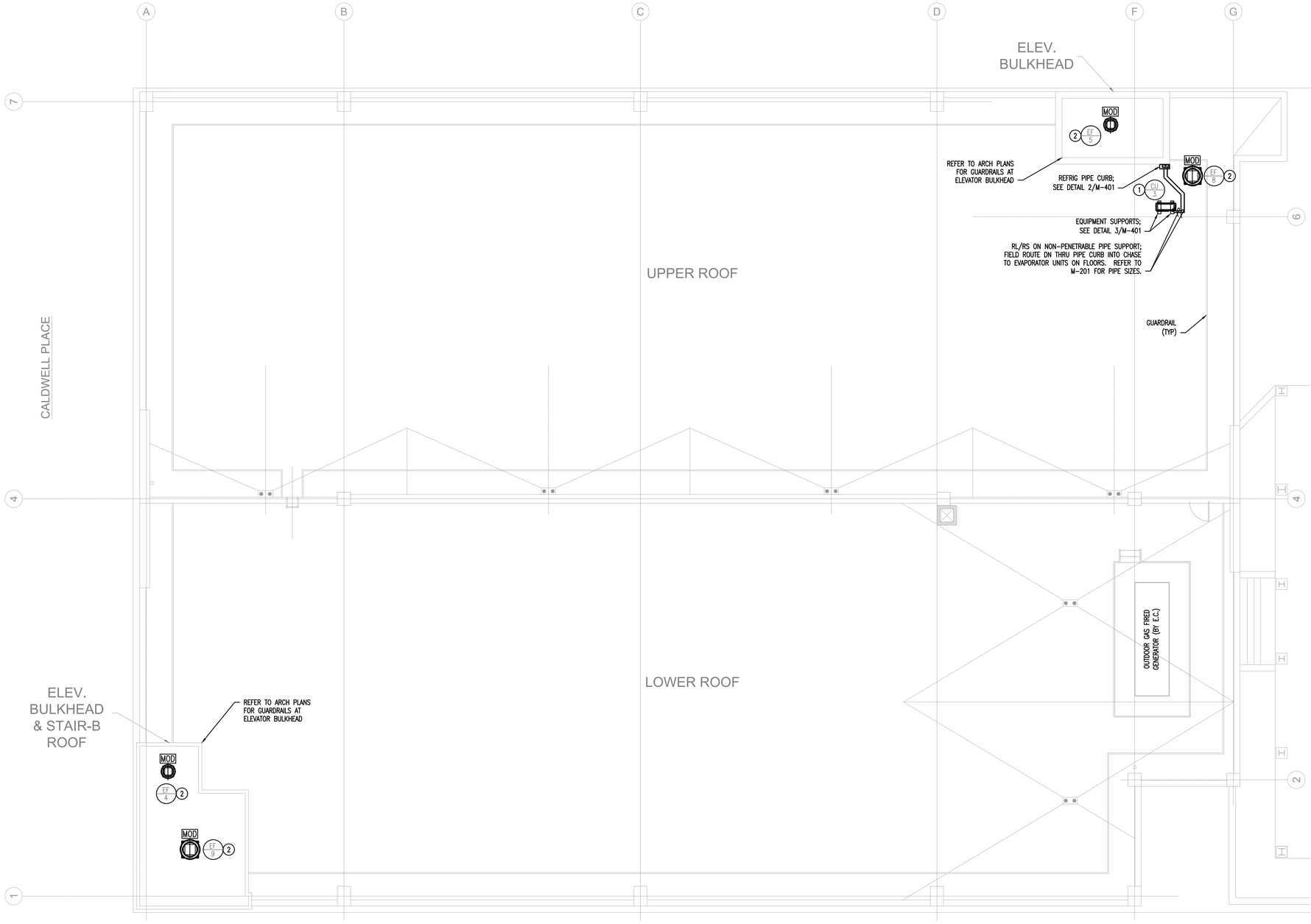
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-104



ELIZABETHTOWN PLAZA

1 M-105 MECHANICAL – NEW GARAGE ROOF PLAN

SCALE: 1/8" = 1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')

NOTE: GARAGE IS NATURALLY VENTILATED IN ACCORDANCE WITH IBC 2018, 406.5.2. REFER TO ARCHITECTURAL DRAWINGS FOR AREA CALCULATIONS.

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

   A. REFER TO MECHANICAL & ELECTRICAL LEAD SHEETS, M-001 & E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

   B. REFER TO DWG M-301 AND M-302 FOR SCHEDULES AND M-401 FOR MECHANICAL DETAILS PERTAINING TO THIS PROJECT.

   C. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.

   D. COORDINATION OF ALL BUILDING-SIDE HVAC WORK WITH THE OWNER'S HVAC PERSONNEL IS A REQUIREMENT OF THIS PROJECT.

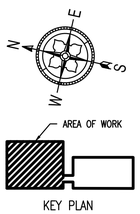
   E. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) CONTRACTOR SHALL FURNISH AND INSTALL CONDENSING UNIT IN LOCATION AS SHOWN AND WITH CHARACTERISTICS AS NOTED IN THE SCHEDULE AND SPECIFICATIONS. MOUNT CONDENSING UNIT ON MINIMUM 18" HIGH EQUIPMENT SUPPORTS. PROVIDE POSITIVE ATTACHMENT OF SUPPORT TO ROOF STRUCTURE AND POSITIVE ATTACHMENT OF CONDENSING UNIT TO SUPPORTS. COORDINATE REFRIGERANT ROUTING WITH MANUFACTURER AND SUBMIT PROPOSED ROUTING AND REFRIGERANT PIPE SIZING TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION. ALL REFRIGERANT SIZING SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS BASED ON EQUIPMENT AND LENGTH OF REFRIGERANT RUN. CONTRACTOR SHALL FURNISH AND INSTALL POWER AND CONTROL WIRING BETWEEN CONDENSING UNIT AND INDOOR UNITS PER MANUFACTURER REQUIREMENTS TO PROVIDE A COMPLETE AND WORKING SYSTEM.

(2) CONTRACTOR SHALL FURNISH AND INSTALL EXHAUST FANS IN LOCATION AS SHOWN AND WITH CAPACITIES AND CHARACTERISTICS AS NOTED WITHIN THE SCHEDULES AND SPECIFICATIONS. PROVIDE WITH CURB MOUNTED MOTOR OPERATED DAMPER AND INTERLOCK DAMPER SUCH THAT THE DAMPER MUST PROVE OPEN BEFORE THE FAN ENGAGES.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE ROOF PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

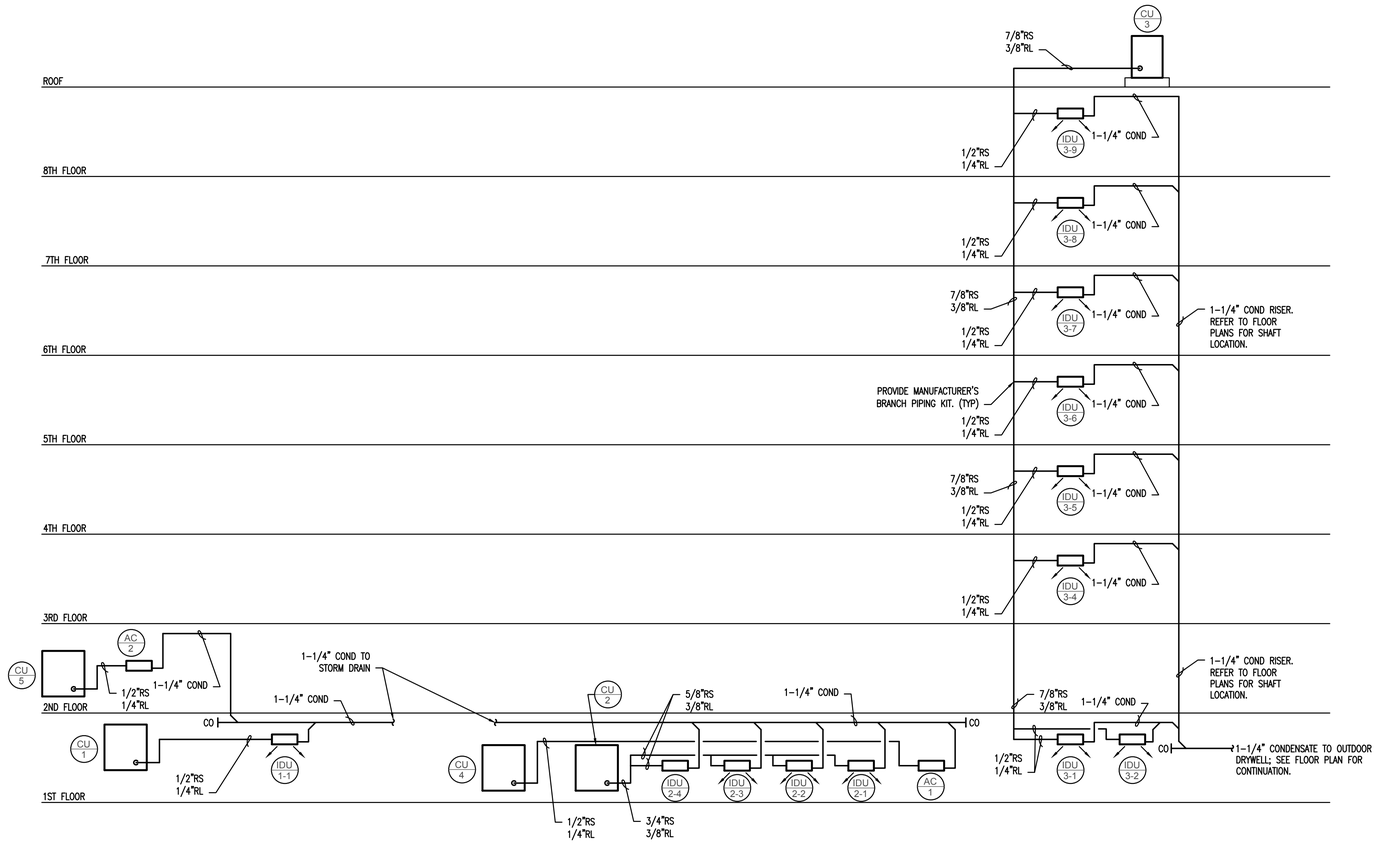
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-105



1 M-201 MECHANICAL – NEW GARAGE VRF PIPING DIAGRAM

SCALE: N.T.S.

NOTES:

1. REFRIGERANT PIPE SIZES ARE PRELIMINARY AND BASED ON ROUTING AS SHOWN ON PLANS. CONTRACTOR SHALL COORDINATE FINAL ROUTING BASED ON FIELD CONDITIONS WITH EQUIPMENT MANUFACTURER AND SIZE PIPING ACCORDINGLY. PROVIDE MANUFACTURER RECOMMENDED PIPE SIZING TO ENGINEER FOR RECORD.
2. CU-1 AND CU-2 SHALL BE WALL MOUNTED AS SHOWN ON PLANS.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

MECHANICAL - NEW GARAGE VRF PIPING DIAGRAM

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-201

VRF INDOOR UNIT SCHEDULE

SYMBOL: IDU #

SYMBOL	LOCATION/ SERVICE	TYPE	TOTAL CFM	DESIGN MIN O.A. CFM	ESP (IN WC)	AIR FILTERS		REF TYPE	COOLING				HEATING			ELECTRICAL			OPER WEIGHT	BASIS OF DESIGN		NOTES
						TYPE	EFF%		MIN NET CAP (MBH)		EAT(°F)		CAPACITY (MBH)	EAT (°F) DB	LAT (°F) DB	V/PH/HZ	MOCP	MCA (A)		MANUFACTURER	MODEL NUMBER	
									TOTAL	SENS	DB	WB										
IDU 1-1	1F VESTIBULE	CASSETTE	477	35	-	RESIN NET	30	R-410A	18	16	80	67	20	68	87	208-230/1/60	15	0.6	63	DAIKIN	FCQ18TAVJU	1,2,3
IDU 2-1	1F/SHERIFF'S DEPT	HORIZONTAL	953	75	0.4	DISPOSABLE	MERV 8	R-410A	36	28.8	80	67	40	68	105	208-230/1/60	15	2.9	102	DAIKIN	FXMQ36PBVJU	1,3,4,5
IDU 2-2	1F/SHERIFF'S DEPT	CASSETTE	436	40	-	RESIN NET	30	R-410A	10.1	8.1	80	67	13.9	68	97	208-230/1/60	15	0.3	63	DAIKIN	FXFQ12TVJU	1,2,3
IDU 2-3	1F/SHERIFF'S DEPT	CASSETTE	436	40	-	RESIN NET	30	R-410A	10.1	8.1	80	67	13.9	68	97	208-230/1/60	15	0.3	63	DAIKIN	FXFQ12TVJU	1,2,3
IDU 2-4	1F/SHERIFF'S DEPT	CASSETTE	436	0	-	RESIN NET	30	R-410A	10.1	8.1	80	67	13.9	68	97	208-230/1/61	15	0.3	63	DAIKIN	FXFQ12TVJU	1,2,3
IDU 3-1	1F/EMC	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXGQ07TVJU	1,2,3
IDU 3-2	1F/LOBBY	CASSETTE	436	50	-	RESIN NET	30	R-410A	8	7.4	80	67	10.8	68	90	208-230/1/60	15	0.3	42	DAIKIN	FXFQ09TVJU	1,2,3
IDU 3-4	3F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3
IDU 3-5	4F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3
IDU 3-6	5F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3
IDU 3-7	6F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3
IDU 3-8	7F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3
IDU 3-9	8F/LOBBY	CASSETTE	420	20	-	RESIN NET	30	R-410A	6.3	5.8	80	67	8.8	68	87	208-230/1/60	15	0.3	42	DAIKIN	FXFQ07TVJU	1,2,3

NOTES:

1. PROVIDE INSULATION FOR ALL REFRIGERANT PIPING PER SPECIFICATIONS.
2. PROVIDE FRESH AIR INTAKE KIT. PROVIDE MOTOR OPERATED DAMPER AND INTERLOCK WITH UNIT. DAMPER TO BE OPEN WHEN UNIT IS IN OPERATION.
3. FURNISH AND INSTALL MANUFACTURER'S THERMOSTAT AND WIRE TO EVAPORATOR.
4. PROVIDE MOTOR OPERATED FRESH AIR DAMPER AND INTERLOCK WITH UNIT. DAMPER TO BE OPEN WHEN UNIT IS IN OPERATION.
5. PROVIDE WITH DAIKIN DZK ZONING KIT (MODEL NUMBER DZK048E4-3) AND THERMOSTATS AS LOCATED ON PLAN FOR MULTIPLE ZONE CONTROL.

VRF SYSTEM AIR COOLED CONDENSING UNIT SCHEDULE

SYMBOL: CU #

SYMBOL	LOCATION	SERVICE	REFRIG TYPE	EER	COP	NOM COOLING CAP (MBH)	NOM HEATING CAPACITY (MBH)	EAT		MIN AMB TEMP (°F)	COMPRESSOR	FANS	ELECTRICAL			NOISE RATING DB	OPER WEIGHT (LBS)	BASIS OF DESIGN	
								°F DB	°F WB		QTY	QTY	V/PH/Hz	MCA	MOCP			MANUFACTURER	MODEL NUMBER
CU-1	ROOF	IDU 1-1	R-410A	13	3.49	18	20	95	75	10	1	1	208-230/60/1	16.5	25	58	172	DAIKIN	RZQ18TAVJU
CU-2	1F WALL MOUNTED	IDU 2-1 AND IDU 2-2	R-410A	9.2	3.49	60	46	95	75	10	1	2	208-230/60/1	29.1	35	74	225	DAIKIN	RXTQ60TAVJUA
CU-3	ROOF	IDU 3-1 THRU IDU 3-10	R-410A	14.3	3.45	96	108	95	75	10	1	2	460/3/60	21	25	81	553	DAIKIN	RXYQ96XAYDA

NOTES:

1. NOMINAL COOLING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 80°FDB/67°FWB AND OUTDOOR AMBIENT TEMPERATURE OF 95°FDB.
2. NOMINAL HEATING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 70°FDB AND OUTDOOR AMBIENT OF 43°FWB.
3. UNITS SHALL BE SELECTED SUCH THAT ADJUSTED CAPACITY BASED ON ACTUAL AMBIENT CONDITIONS IN HEATING MODE (MIN AMBIENT TEMP) IS MINIMUM 88% OF NOMINAL CAPACITY.
4. PROVIDE HIGH PRESSURE SWITCH, INVERTER OVER-CURRENT AND OVER-HEAT PROTECTION, COMPRESSOR OVER-HEAT PROTECTION, PCB OVER-CURRENT PROTECTION.
5. CONTRACTOR SHALL PROVIDE AND INSTALL MANUFACTURER CONTROL PACKAGE INCLUDING BACNET INTERFACE. INTEGRATION TO BMS BY OTHERS.
6. PROVIDE EQUIPMENT SUPPORTS FOR CU-3. PROVIDE POSITIVE ATTACHMENT OF SUPPORT TO ROOF STRUCTURE AND POSITIVE ATTACHMENT OF CU TO SUPPORT.
7. PROVIDE MANUFACTURER SUPPLIED WALL MOUNTING BRACKET, PART NO DACA-WB-3 FOR CU-1 AND CU-2. UNIT SHALL BE WALL MOUNTED IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS.

DUCTLESS SPLIT SYSTEM HEAT PUMP SCHEDULE

SYMBOL: AC # / CU #

SYMBOL		LOCATION	SERVICE	INDOOR UNIT		OUTDOOR UNIT					COOLING		HEATING			ELECTRICAL DATA			OPER WEIGHT (LBS)		BASIS OF DESIGN	
INDOOR UNIT	OUTDOOR CONDENSING UNIT			TYPE	TOTAL CFM	COMPRESSOR			CONDENSER FAN		CAPACITY (MBH)	SEER	CAPACITY (MBH)		COP	MCA	MOP	V/PH/Hz	INDOOR UNIT	OUTDOOR CONDENSING UNIT	MANUFACTURER	MODEL NUMBER
						QTY	RLA	REFRIG TYPE	QTY	FAN MOTOR FLA			@ 17°F AMBIENT	@ 47°F AMBIENT								
AC-1	CU-4	1F IT ROOM	IT ROOM	WALL MTD	434	1	4.08	R-410A	1	.45	10.9	20	15.3	18.8	3.9	13.0	15	208/60/1	18	80	DAIKIN	FTX12N/RXL12
AC-2	CU-5	1F IT ROOM	IT ROOM	WALL MTD	434	1	4.08	R-410A	1	.45	10.9	20	15.3	18.8	3.9	13.0	15	208/60/1	18	80	DAIKIN	FTX12N/RXL12

NOTES:

1. PROVIDE DISCONNECT SWITCH
2. EVAPORATOR SHALL BE WALL MOUNTED
3. PROVIDE MANUFACTURER'S PROGRAMMABLE 7-DAY THERMOSTAT
4. PROVIDE LOW AMBIENT OPERATION KIT TO 0 DEGREE OUTDOOR AMBIENT
5. PROVIDE WALL MOUNTED CONDENSATE PUMP AND RUN CONDENSATE TO NEAREST INDIRECT WASTE
6. REFER TO MECHANICAL SPECIFICATIONS FOR FURTHER REQUIREMENTS
7. INDOOR UNIT IS POWERED OFF OF OUTDOOR UNIT
8. INDOOR PROVIDES COOLING OR HEATING
9. PROVIDE MANUFACTURER SUPPLIED WALL MOUNTING BRACKET, PART NO DACA-WB-3 FOR CU-4 AND CU-5. UNITS SHALL BE WALL MOUNTED IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

NEW GARAGE MECHANICAL SCHEDULES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-301

EXHAUST FAN SCHEDULE

SYMBOL: EF

SYMBOL	SERVICE	LOCATION	CFM	ESP	FAN RPM	MOTOR HP	ELECTRICAL	OPER WEIGHT (LBS)	BASIS OF DESIGN		NOTES
							V/PH/HZ		MANUFACTURER	MODEL NUMBER	
EF-1	MAIN ELECTRIC ROOM	MAIN ELECTRIC ROOM	250	0.125	956	29 WATTS	120/1/60	25	GREENHECK	SP-A390-VG	1,2,3
EF-2	FIRE PUMP ROOM	FIRE PUMP ROOM	250	0.125	956	29 WATTS	120/1/60	16	GREENHECK	SP-A390-VG	1,2,3
EF-3	SHERIFF'S DEPARTMENT RESTROOM	RESTROOM	80	0.2	950	45WATTS	120/1/60	16	GREENHECK	CSP-A110	1,2,3
EF-4	ELEVATOR SHAFT	ROOF	500	0.25	874	0.25	120/1/60	61	GREENHECK	CUBE-100	1,3,4,5,6,7
EF-5	ELEVATOR SHAFT	ROOF	500	0.25	874	0.25	120/1/60	61	GREENHECK	CUBE-100	1,3,4,5,6,7
EF-6	1F STORAGE AREA	STORAGE ROOM	500	0.25	874	0.25	460/3/60	75	GREENHECK	USF-310	1,2,3
EF-7	EMERGENCY ELECTRICAL ROOM	EMERGENCY ELECTRICAL ROOM	250	0.125	956	29 WATTS	120/1/60	25	GREENHECK	SP-A390-VG	1,2,3
EF-8	STAIR A	ROOF	3100	0.125	835	0.75	277/1/60	81	GREENHECK	G-180-VG	1,3,5,6,7
EF-9	STAIR B	ROOF	2300	0.125	695	0.75	277/1/60	81	GREENHECK	G-180-VG	1,3,5,6,7
TF-1	IT RM CLEAN AGENT	ITRM CLEAN AGENT	80	0.2	950	45WATTS	120/1/60	16	GREENHECK	CSP-A110	1,2,3

NOTES:
1. PROVIDE MOTOR OPERATED BACKDRAFT DAMPER. INTERLOCK DAMPER OPERATION WITH EXHAUST FAN OPERATION. MOTORIZED DAMPER TO HAVE SAME VOLTAGE AS FAN.
2. PROVIDE WITH NEOPRENE VIBRATION ISOLATION HANGERS.
3. PROVIDE WITH SPEED CONTROLLER.
4. PROVIDE FAN UL LISTED FOR EMERGENCY SMOKE CONTROL.
5. PROVIDE WITH 18" MINIMUM ROOF CURB.
6. PROVIDE FACTORY MOUNTED PRE-WIRED DISCONNECT SWITCH.
7. PROVIDE BIRDSCREEN.

AIR TERMINAL DEVICE SCHEDULE

SYMBOL	SERVICE	TYPE	CFM RANGE	NECK SIZE	N.C	FACE OVERALL DIMENSIONS WxL (IN.)	BASIS OF DESIGN	
							MANUFACTURER	MODEL NUMBER
CD-1	SUPPLY	DUCT MOUNTED	100-250	8"ø	20	18"ø	PRICE	RCD
TG-1	TRANSFER	WALL	500-800	18x10	-	20x12	PRICE	530
TG-2	TRANSFER	WALL	75	6"ø	-	8"ø	PRICE	RECG
TG-3	TRANSFER	WALL	0-300	12x8	20	14x10	PRICE	530
RG-1	RETURN	LAY-IN	0-1600	22x22	-	24x24	PRICE	530

NOTES:
1. REFER TO MECHANICAL DRAWINGS FOR LOCATIONS.
2. MOUNTING FRAME TYPE SHALL BE COORDINATED WITH THE CEILING/WALL CONSTRUCTION TYPE.
3. FLEXIBLE DUCTS CONNECTING TO THE DIFFUSERS SHALL BE FULL SIZE OF NECK DIAMETER AND NOT EXCEED 5' IN LENGTH.
4. ALL GRILLES MOUNTED IN CEILINGS, SOFFITS, OR WALLS SHALL HAVE BAKED WHITE ENAMEL FINISH OR COLOR AS SELECTED BY ARCHITECT. FINAL COLORS TO BE DETERMINED POST AWARD. ALL GRILLES MOUNTED ON GALVANIZED EXPOSED DUCTWORK SHALL HAVE CLEAR ANODIZED FINISH
5. REFER TO ARCHITECTS REFLECTED CEILING PLANS FOR ALL FINAL LOCATIONS OF DIFFUSERS AND GRILLES

UNIT HEATER SCHEDULE

SYMBOL	LOCATION	DISCHARGE TYPE	FAN			ELECTRIC COIL				OPER WEIGHT (LBS)	BASIS OF DESIGN	
			CFM	RPM	HP	KW	NO. STEPS	V/PH/HZ	FLA		MANUFACTURER	MODEL NUMBER
UH-1	MAIN ELECTRICAL ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	3.6	38	QMARK	MUH 03-41
UH-2	FIRE PUMP ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	6	27	QMARK	MUH 03-41
UH-3	FIRE PUMP ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	6	27	QMARK	MUH 03-41
UH-4	1F STORAGE ROOM	HORIZONTAL	350	1600	1/100	5	1	480/3/60	3.6	27	QMARK	MUH 03-41
UH-5	1F STORAGE ROOM	HORIZONTAL	350	1600	1/100	5	1	480/3/60	3.6	27	QMARK	MUH 03-41
UH-6	2F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	3.6	27	QMARK	MUH 03-41
UH-7	3F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/61	3.6	27	QMARK	MUH 03-41
UH-8	4F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/61	3.6	27	QMARK	MUH 03-41
UH-9	5F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/61	3.6	27	QMARK	MUH 03-41
UH-10	6F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/62	3.6	27	QMARK	MUH 03-41
UH-11	7F SPRINKLER VALVE ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	3.6	27	QMARK	MUH 03-41
UH-12	EMERGENCY ELECTRICAL ROOM	HORIZONTAL	350	1600	1/100	3	1	480/3/60	3.6	27	QMARK	MUH 03-41

NOTES:
1. PROVIDE WITH UNIT MOUNTED THERMOSTAT
2. PROVIDE WITH NON-FUSED DISCONNECT
3. PROVIDE WITH MANUFACTURER'S STANDARD MOUNTING BRACKET

CABINET UNIT HEATER SCHEDULE

SYMBOL: CUH

SYMBOL	SERVICE	ELECTRIC COIL				FAN	BASIS OF DESIGN	
		KW	NO. OF STEPS	V/PH/HZ	FLA	CFM	MFG	MODEL NUMBER
CUH-1	SHERIFF'S DEPARTMENT ENTRANCE	1.5	1	277/1/60	10.8	150	QMARK	EFF3007

NOTES:
1. PROVIDE WITH DISCONNECT SWITCH.
2. PROVIDE WITH UNIT MOUNTED THERMOSTAT.

ELECTRIC BASEBOARD CONVECTOR SCHEDULE

SYMBOL: EBB

SYMBOL	STYLE	NO. ELEMENTS	ELECTRICAL			BASIS OF DESIGN	
			WATTS	AMPS	V/PH/HZ	MANUFACTURER	MODEL NUMBER
EBB-1	WALL MTD	1	750	6.25	120/1/60	QMARK	2513

NOTES:
1. COORDINATE FINAL COLOR SELECTION WITH ARCHITECT.
2. PROVIDE WITH UNIT MOUTNED THERMOSTAT.
3. PROVIDE WITH DISCONNECT SWITCH.

LOUVER SCHEDULE

SYMBOL: LV

SYMBOL	SERVICE	NOMINAL SIZE (W IN x H IN)	CFM	MIN FREE AREA (SQFT)	VEL (FPM)	BEGINNING PT OF WATER PENETRATION (FPM)	ΔP (IN WC)	BASIS OF DESIGN	
								MANUFACTURER	MODEL NUMBER
LV-1	INTAKE	14x12	155	0.2	632	1250	0.06	GREENHECK	ESD-635

NOTES:
1. COORDINATE MOUNTING STYLE WITH ARCHITECTURAL PLANS.
2. PROVIDE WITH INSECT SCREEN.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

NEW GARAGE MECHANICAL SCHEDULES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

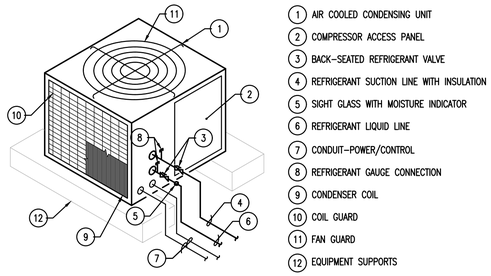
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-302

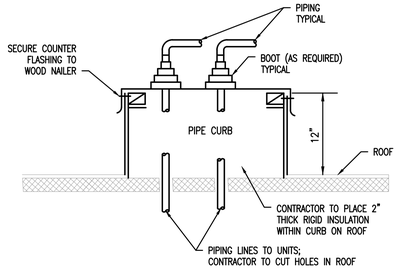


1 M-401 TYPICAL CONDENSING UNIT PIPING DETAIL

SCALE: N.T.S.

NOTES:

1. CONTRACTOR SHALL COORDINATE FINAL CONNECTIONS WITH MANUFACTURER'S INSTRUCTIONS.
2. CONTRACTOR SHALL ANCHOR CONDENSING UNIT TO EQUIPMENT SUPPORTS PER MANUFACTURER'S INSTRUCTIONS.
3. FOR WALL MOUNTED CONDENSING UNITS CONTRACTOR SHALL FURNISH AND INSTALL ALL PIPING SPECIALTIES AND MOUNT UNIT TO WALL UTILIZING MANUFACTURER'S WALL BRACKET WITH EXPANSION ANCHORS SUITABLE FOR THE EQUIPMENT LOADS.

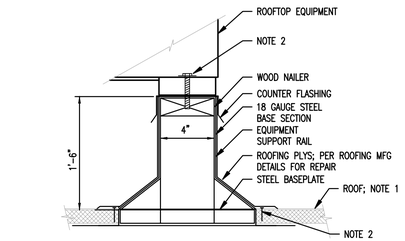


2 M-401 PIPE CURB INSTALLATION DETAIL

SCALE: N.T.S.

NOTES:

1. FINAL FINISH AND SEALING OF PIPE CURBS SHALL BE IN ACCORDANCE WITH METHODS APPROVED BY ROOFING MANUFACTURER OF THE ROOFING SYSTEM. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL REQUIREMENTS.
2. PIPE CURBS TO BE UTILIZED FOR BOTH MECHANICAL AND ELECTRICAL SERVICES.

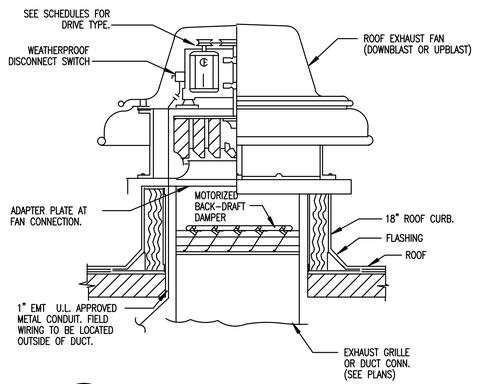


3 M-401 EQUIPMENT SUPPORT DETAIL

SCALE: N.T.S.

NOTES:

1. VERIFY ALL ROOFING MATERIALS AND FLASHING REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.
2. POSITIVELY ANCHOR EQUIPMENT TO EQUIPMENT SUPPORT AND EQUIPMENT SUPPORT TO STRUCTURE PER MFG'S INSTRUCTIONS AND TO MEET WIND RESTRAINT REQUIREMENT OF IBC 2018. REFER TO SPEC 230548 FOR ADDITIONAL REQUIREMENTS.

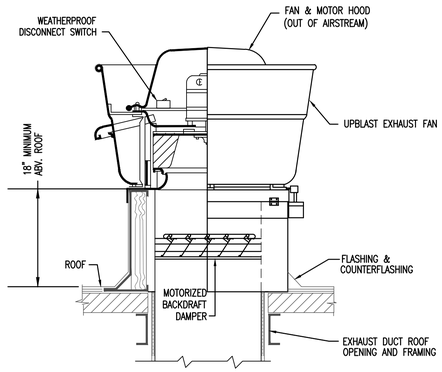


4 M-402 DOWNBLAST FAN DETAIL

SCALE: N.T.S.

NOTES:

1. VERIFY ALL ROOFING MATERIALS WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
2. POSITIVELY ANCHOR EQUIPMENT TO EQUIPMENT ROOF CURBS AND ROOF CURB TO STRUCTURE PER MANUFACTURER'S INSTRUCTIONS AND TO MEET WIND RESTRAINT REQUIREMENTS OF IBC 2018. REFER TO SPECIFICATION 230548 FOR ADDITIONAL REQUIREMENTS.

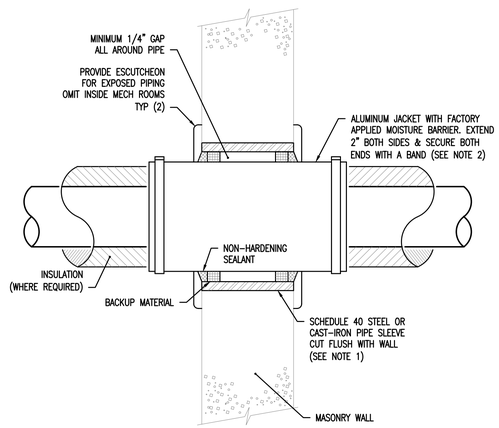


5 M-401 ROOF MOUNTED UPBLAST EXHAUST FAN

NOT TO SCALE

NOTES:

1. VERIFY ALL ROOFING MATERIALS WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
2. POSITIVELY ANCHOR EQUIPMENT TO EQUIPMENT ROOF CURBS AND ROOF CURB TO STRUCTURE PER MANUFACTURER'S INSTRUCTIONS AND TO MEET WIND RESTRAINT REQUIREMENTS OF IBC 2018. REFER TO SPECIFICATION 230548 FOR ADDITIONAL REQUIREMENTS.

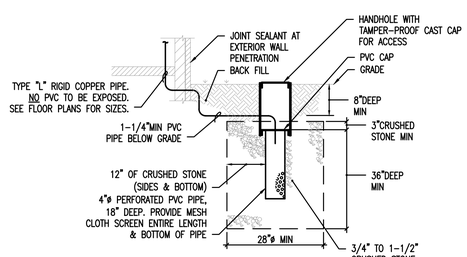


6 M-401 WALL PENETRATION DETAIL

SCALE: N.T.S.

NOTES:

1. FOR GYP. BOARD WALLS PROVIDE MIN. 16 GAUGE GALV. STEEL SLEEVE W/ LOCK-TYPE LONGITUDINAL SEAM.



7 M-401 CONDENSATE DRYWELL DETAIL

SCALE: N.T.S.

NOTES:

1. ALL CONDENSATE DRAIN PIPING LOCATED BELOW GRADE SHALL BE A MINIMUM 1-1/4"PVC AND SLOPED A MINIMUM OF 1/8" PER/FT.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

NOT FOR CONSTRUCTION

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

NEW GARAGE MECHANICAL DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

M-401

ELECTRICAL SYMBOLS, NOTES, AND ABBREVATIONS

GENERAL SYMBOLS

SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE, 125V, 20A–MOUNTED 18" A.F.F. UNLESS OTHERWISE NOTED
CP	DUPLEX RECEPTACLE, 125V, 20A–LOCATED WITHIN 2' OF CONDENSATE PUMP
TV	DUPLEX RECEPTACLE, 125V, 20A–MOUNTED 12" B.C. UNLESS OTHERWISE NOTED
	QUADRAPLEX RECEPTACLES 125V, 20A, – MOUNTED 18" A.F.F. UNLESS OTHERWISE NOTED
	SPECIAL OUTLET – AS NOTED ON THE DRAWING
	JUNCTION BOX
	RECESSED FLOOR BOX – WIREMOLD CAT#885 OR ENGINEER APPROVED EQUAL. COORDINATE ACTIVATION COVER PLATE W/OWNER/ARCHITECT APPROVAL.
	RECESSED MULTISERVICE STEEL FLOOR BOX – WIREMOLD CAT#RFB4–SS OR ENGINEER APPROVED EQUAL. COORDINATE ACTIVATION COVERS W/OWNER/ARCHITECT APPROVAL.
	MULTI–OUTLET ASSEMBLY WITH CONDUIT STUB–UPS TO 6" ABOVE CEILING
	BRANCH CIRCUIT WIRING – CONCEALED
	HOME RUN TO PANELBOARD
	ROOFTOP LIGHT AND GFI RATED RECEPTACLE
	POINT OF CONNECTION TO EXISTING
	POINT OF DISCONNECTION FROM EXISTING
	UNFUSED SAFETY SWITCH
	FUSED SAFETY SWITCH
	FUSED COMBINATION MAGNETIC STARTER
	TRANSFORMER
	MOLDED CASE CIRCUIT BREAKER
	FUSE
	MOTOR – 5 INDICATES MOTOR HORSE POWER
	UTILITY COMPANY METER
	DELTA CONNECTION
	MOUNTING WYE CONNECTION
	CONNECTION TO MAIN METAL WATER PIPING
	CURRENT TRANSFORMER
GF	GROUND FAULT CURRENT PROTECTION
	208/120V PANELBOARD – SURFACE MOUNTED
	480/277V PANELBOARD – SURFACE MOUNTED
	208/120V PANELBOARD – RECESSED IN WALL
	480/277V PANELBOARD – RECESSED IN WALL
SPD	SURGE PROTECTIVE DEVICE – AS SPECIFIED
	CONNECTION TO GROUND (GND), PER APPLICABLE SECTION OF ARTICLE 250, N.E.C.
H	HEAT DETECTOR
F	SPEAKER/STROBE
CO	CARBON MONOXIDE DETECTOR
R	SHUTDOWN RELAY
	CEILING MOUNTED SECURITY CAMERA
	WALL MOUNTED SECURITY CAMERA
CR	WALL MOUNTED CARD READER
IS	INTERCOM STATION
	JUNCTION BOX
	AIR TERMINAL BONDED TO CONDUCTOR
	COPPER CONDUCTOR, CLASS II
	THRU–ROOF CONNECTION TO BUILDING STRUCTURAL STEEL
	3/4" COPPERWELD GROUND ROD, 10' LONG
	GROUND CONDUCTOR – EMBEDDED
	GROUND CONDUCTOR – EXPOSED
	BOLTED EQUIPMENT/STRUCTURE GROUND CONNECTION
TW	TEST WELL
	5'–0" COILED GROUND CONDUCTOR FOR FUTURE GROUND CONNECTION
	TAP CONNECTION TO GROUNDING LOOP
ACP	ACCESS CONTROL PANEL
IMS	INTERCOM MASTER STATION

MOUNTING HEIGHT CHART – ELECTRICAL EQUIPMENT

MOUNTING HEIGHT (AFF)	EQUIPMENT SYMBOL (OR REFER TO DESCRIPTION, NEXT COLUMN)	DESCRIPTION OF EQUIPMENT (DEVICES, OUTLETS, ETC.)	REMARKS
12'–0" OR AS NOTED ON PLAN		EXTERIOR WALL MOUNTED LIGHTING FIXTURES	
10'–0"		BATTERY OPERATED EMERGENCY LIGHTING UNITS OR REMOTE MOUNTED HEADS	OR 1' BELOW CEILING WHICH EVER HEIGHT IS LOWER
8'–6"		PENDANT MOUNTED INDUSTRIAL AND STRIP LIGHTING FIXTURES	
8'–4"	SP	WALL MOUNTED CLOCKS AND SPEAKERS	OR 9" BELOW CEILING WHICH EVER HEIGHT IS LOWER
7'–6"		TOP OF EXIT SIGNS (NOT MOUNTED ABOVE A DOOR)	
80" A.F.F. OR 6" BELOW THE CEILING – WHICHEVER IS LOWER	EK F	FIRE ALARM NOTIFICATION DEVICES	
6'–6"		CENTERLINE OF INTERIOR WALL MOUNTED FIXTURES	
6'–0"		MAXIMUM ELEVATION OF DISCONNECT SWITCHES, STARTERS AND CONTACTORS	
4'–6"		MAXIMUM ELEVATION OF WALL MOUNTED PHONES	3'–6" FOR ADA DEVICES
4'–0"		WALL MOUNTED WIREMOLD	
3'–6"	EPO S S_3 T	WALL MOUNTED ELECTRICAL CONTROL DEVICES, SWITCHES, MANUAL MOTOR STARTERS, AND FIRE ALARM PULL STATIONS	
3'–0"		WALL MOUNTED RECEPTACLE IN MECHANICAL, ELECTRICAL, AND ELEVATOR ROOMS AND ON BUILDING EXTERIORS	
1'–6"	D TC	WALL MOUNTED RECEPTACLE, DATA OUTLET, TELEPHONE OUTLET OR SPECIAL RECEPTACLE	

1. MOUNTING HEIGHT OF EQUIPMENT LISTED SHALL BE AS INDICATED OR AS SPECIFIED ON THE DRAWINGS. ACTUAL MOUNTING HEIGHT MAY BE ADJUSTED TO FIELD CONDITIONS, INCLUDING THE WALL CONSTRUCTION ELEMENTS (BLOCKS, ETC.).
2. MOUNTING HEIGHTS SHALL COMPLY WITH THE STATE UNIFORM CONSTRUCTION CODE.
3. MOUNTING HEIGHT INDICATED FOR THE CENTERLINE OF THE DEVICE OR OUTLET, OR TO THE CENTER OF THE OPERATING CONTROL DEVICE, UNLESS NOTED OTHERWISE. HEIGHTS INDICATED ARE APPLICABLE OVER GRADE, PLATFORM AND OTHER OPERATING LEVELS, AS WELL.
4. RECEPTACLES OUTLETS SHALL BE 12" ABOVE COUNTERTOP, 6" ABOVE TABLE OR DESKTOP, 4" ABOVE BACKSPLASH OR AS NOTED ON ELECTRICAL OR ARCHITECTURAL LAYOUTS AND DETAILS.
5. THIS CHART, INCLUDING THE NOTES, ARE APPLICABLE EVEN IF MOUNTING HEIGHT IS SPECIFIED ON THE SYMBOL LIST.

ABBREVATIONS

A.F.F.	ABOVE FINISHED FLOOR	N.E.C.	NATIONAL ELECTRIC CODE
C., CND	CONDUIT	NC	NORMALLY CLOSED
B.C.	BELOW CEILING	NO	NORMALLY OPEN
B.F.G.	BELOW FINISHED GRADE	PH	PHASE
CP	CONTROL PANEL	PVC	POLYVINAL CHLORIDE CONDUIT, SCHEDULE 40
D	DEMOLISH	R	REMOVE
DISC.	DISCONNECT	RE	RELOCATE
DWG	DRAWING	RGS	RIDGED GALVANIZED STEEL CONDUIT
E	EXISTING	SW	SWITCH
ED	EXISTING TO BE DEMOLISHED	U.O.N.	UNLESS OTHERWISE NOTED
E.C.	ELECTRICAL CONTRACTOR	UG, U/G	UNDERGROUND
EWC	ELECTRIC WATER COOLER	V	VOLT
F.P.C.	FIRE PROTECTION CONTRACTOR	VFD	VARIABLE FREQUENCY DRIVE
G., GND	GROUND	W/	WITH
GEN	GENERATOR	WG	WIRE GUARD
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	WP	WEATHERPROOF
K.E.C.	KITCHEN EQUIPMENT CONTRACTOR	4W	FOUR WIRE
KW	KILOWATTS	25A	25 AMPERES
KVA	KILOVOLT AMPERES		
LA	XFMR LIGHTNING ARRESTOR (15kV CLASS)		
M	MODIFIED		

GENERAL SYMBOLS CONT'D

SYMBOL	DESCRIPTION
	POTS LINE. PROVIDE, INSTALL, TERMINATE AND TEST SINGLE CAT–3 DATA WIRE TO BE RUN TO DOUBLE GANG, RECESSED WALL BOX WITH SINGLE GANG FLANGE, WITH 3/4" CONDUIT RAN UP 6" ABOVE THE CEILING. SEE WIRE SPECIFICATION FOR ADDITIONAL INFORMATION.
XX	PROVIDE, INSTALL, TERMINATE AND TEST CAT–6 DATA WIRES TO BE RUN TO DOUBLE GANG, RECESSED WALL BOX WITH SINGLE GANG FLANGE, WITH 3/4" CONDUIT RAN UP 6" ABOVE THE CEILING. SEE WIRE SPECIFICATION FOR ADDITIONAL INFORMATION. XX REPRESENTS THE QUANTITY OF REQUIRED CAT–6 DATA WIRES.
WAP	PROVIDE, INSTALL, TERMINATE AND TEST TWO CAT–6A DATA WIRES TO BE RUN TO PANDUIT 2–PORT SURFACE MOUNT BOX, MOUNTED ABOVE CEILING FOR WIRELESS ACCESS POINT. SEE WIRE SPECIFICATION FOR ADDITIONAL INFORMATION.
EH	SECURITY ALARM DEVICE AND/OR CONTACT (ALARM CONTROL FUNCTION) EH – ELECTRIC DOOR HINGE EL – ELECTRIFIED LOCKSET DP – DOOR POSITION RX – REQUEST TO EXIT GC – GATE CONTROL TR – LONG RANGE PROX TAG READER EC – ELEVATOR CONTROL

GENERAL ELECTRICAL PROJECT NOTES

1. SOME LEGEND SYMBOLS MAY NOT BE USED. SEE PLANS FOR APPLICABLE DEVICES.
2. ALL 125 VOLT, SINGLE–PHASE, 15 AND 20 AMP RECEPTACLES, WHEN INSTALLED OUTDOORS WHERE THERE IS DIRECT ACCESS, SHALL HAVE GROUND–FAULT CIRCUIT INTERRUPTER PROTECTION AND WEATHERPROOF SECURE COVERS WITH LOCKING TAB. THIS SHALL APPLY, BUT NOT BE LIMITED TO, ALL OUTLETS ON THE EXTERIOR OF BUILDING AND ROOF.
3. ALL 125 VOLT, SINGLE–PHASE, 15 AND 20 AMP RECEPTACLES, WHEN INSTALLED WITHIN A SIX FOOT RADIUS OF SINKS, SHALL HAVE GROUND–FAULT CIRCUIT INTERRUPTER PROTECTION. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE (NEC), THE SPECIFICATION, AND THE AUTHORITY HAVING JURISDICTION.
4. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE (NEC), THE SPECIFICATION, AND THE AUTHORITY HAVING JURISDICTION.
5. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.
6. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ENGINEER/OWNER APPROVAL.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.
8. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND THE ENGINEER FOR THE LOCATION OF ALL OUTDOOR LIGHTING FIXTURES, WIRING DEVICES, TRANSFORMERS, PAD MOUNTED SWITCHES, DISCONNECT SWITCHES, PANELBOARDS, AND OTHER EQUIPMENT LOCATED OUTSIDE.
9. ALL EQUIPMENT SPECIFIED IN THIS PROJECT WHICH IS LOCATED OUTDOORS SHALL BE WEATHERPROOF AND NEMA RATED FOR THE ENVIRONMENT/TEMPERATURE TO BE INSTALLED. THIS INCLUDES BUT IS NOT LIMITED TO: WIRING DEVICES, BOXES, ENCLOSURES, ETC. OUTDOOR EQUIPMENT MINIMUM: NEMA 3R RATING ALL PANELS, WIRING DEVICES, BOXES, AND ENCLOSURES LOCATED INDOORS SHALL BE NEMA 1 UNLESS OTHERWISE NOTED.
10. ALL FUSES IN DISCONNECT SWITCHES SHOWN SHALL BE CLASS RK–1, FAST ACTING, UNLESS RECOMMENDED OTHERWISE BY THE EQUIPMENT SUPPLIER/MANUFACTURER.
11. ALL KEY OPERATED SWITCHES SHALL BE KEYED ALIKE.
12. THE ELECTRICAL CONTRACTOR TO PROVIDE MOUNTING SUPPORTS FOR ALL DISCONNECT SWITCHES. USE P1000 UNISTRUT FOR ALL INDOOR SUPPORTS AND GALVANIZED P1000 UNISTRUT FOR ALL OUTDOOR SUPPORTS.
13. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING. COORDINATE ALL FIRE RATED PARTITIONS, WALLS, FLOORS, AND CEILINGS. SUBMIT UL APPROVED METHODS FOR FIRESTOPPING AT EACH SPECIFIC LOCATION.
14. THE ELECTRICAL CONTRACTOR SHALL SECURE FROM OTHER CONTRACTORS ON THE PROJECT: SHOP DRAWINGS TO VERIFY CHARACTERISTICS OF ALL EQUIPMENT TO BE WIRED. IF THE CONTRACTOR FINDS DISCREPANCIES BETWEEN THE SHOP DRAWINGS AND THE ELECTRICAL PLANS, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ENGINEER PROMPTLY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTIONS TO THE ELECTRICAL INSTALLATION IF THE DRAWING REVIEW IS NOT COMPLETED BY THE CONTRACTOR.
15. PANELBOARD CIRCUIT DIRECTORY: SHALL BE TYPED AND INDICATE INSTALLED CIRCUIT LOADS, SUCH AS: RECEPTACLES
16. ALL CABLES LOCATED ABOVE ACCESSIBLE CEILINGS SHALL BE SUPPORTED FROM THE STRUCTURE. CABLES SHALL NOT BE ROUTED ON CEILING PANELS. ACCESS TO CEILING SPACE SHALL NOT BE OBSTRUCTED BY CABLES OR CABLE SUPPORTS.
17. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.
18. THE ENTIRE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST SHALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.
19. PRIOR TO FINAL ACCEPTANCE OF THE ELECTRICAL WORK, THE ELECTRICAL CONTRACTOR SHALL SUBMIT TO THE OWNER A WRITTEN STATEMENT GUARANTEEING ALL EQUIPMENT, MATERIALS, AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE OF THE PROJECT. UPON WRITTEN NOTICE TO THE CONTRACTOR DURING THE WARRANTY PERIOD, THE CONTRACTOR, AT NO EXPENSE TO THE OWNER, SHALL REPAIR OR REPLACE ALL DEFECTIVE MATERIALS OR WORKMANSHIP.
20. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.
21. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.
22. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR LIGHTING AND POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.
23. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.
24. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.
25. THE ELECTRICAL CONTRACTOR SHALL PROVIDE HOUSE KEEPING PADS FOR ELECTRICAL EQUIPMENT FURNISHED UNDER THE ELECTRICAL.
26. ALL FUSED AND NON–FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS & 250 VOLT RATING FOR 208 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.
27. EXISTING CONDUITS SCHEDULED TO BE DEMOLISHED WHICH ARE IN EXISTING CONCRETE SLAB SHALL BE CUT FLUSH WITH GRADE AND CONDUIT OPENING SHALL BE FILLED WITH CONCRETE.
28. NEW CIRCUIT BREAKERS TO BE INSTALLED IN EXISTING PANELBOARDS SHALL MATCH EXISTING TYPES AND RATINGS.

LIGHTING PROTECTION SYSTEM NOTES

A RISK ASSESSMENT SHALL BE PERFORMED BY THE ELECTRICAL CONTRACTOR IN ACCORDANCE WITH NFPA 780 REQUIREMENTS FOR THE BUILDING. IF RECOMMENDED, THE LIGHTNING PROTECTION SYSTEM SHALL BE INSTALLED AND IN COMPLIANCE WITH NFPA 780 REQUIREMENTS. A UL MASTER LABEL CERTIFICATION SHALL BE REQUIRED AT COMPLETION OF INSTALLATION AND INSTALLED AS FOLLOWS:

1. FURNISH AND INSTALL A COMPLETE LIGHTNING PROTECTION SYSTEM.
2. ALL EQUIPMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) ARTICLE 780 AND UL STANDARD 96A.
3. ALL LIGHTNING PROTECTION EQUIPMENT SHALL BE NEW AND LABELED.
4. INSTALLATION SHALL BE PERFORMED BY OR UNDER THE SUPERVISION OF A CERTIFIED LIGHTNING PROTECTION SYSTEM MASTER INSTALLER.
5. SUBMIT FOR REVIEW BY THE ENGINEER AND ARCHITECT FOR APPROVAL PRIOR TO THE START OF WORK:
   - 5.1. SUBMIT SIGNED/SEALED SHOP DRAWINGS DETAILING THE COMPLETE LIGHTNING PROTECTION SYSTEM. INCLUDE ALL SYSTEM DETAILS, CONNECTION DIAGRAMS, AND CALCULATIONS.
   - 5.2. DETAILED LIGHTNING PROTECTION SYSTEM SHOP DRAWINGS.
   - 5.3. SHOP DRAWINGS MUST IDENTIFY THE SIZES AND LOCATIONS FOR ALL LIGHTNING PROTECTION EQUIPMENT.

DRAWING SHEET INDEX

UNION COUNTY PARKING GARAGE

SHEET NO.	DRAWING NUMBER	DRAWING TITLE	ISSUE / DATE	ISSUED FOR BIDDING / 07/28/2021
		ELECTRICAL		
1	E-001	ELECTRICAL LEAD SHEET	X	
2	E-002	ELECTRICAL SINGLE LINE DIAGRAM	X	
3	E-003	ELECTRICAL DETAILS	X	
4	E-004	ELECTRICAL DETAILS	X	
5	E-005	ELECTRICAL GROUNDING DETAILS	X	
6	E-006	ELECTRICAL GROUNDING DIAGRAM	X	
7	E-007	ELECTRICAL LIGHTNING PROTECTION DETAILS	X	
8	E-008	ELECTRICAL PANEL AND LUMINAIRE SCHEDULES	X	
9	E-009	ELECTRICAL PANEL SCHEDULES	X	
10	E-010	ELECTRICAL LOW VOLTAGE DIAGRAMS	X	
11	E-011	ELECTRICAL ACCESS CONTROL DETAILS	X	
12	E-012	ELECTRICAL CAMERA DETAILS AND ENLARGED IT ROOM PLAN	X	
13	ED-100	ELECTRICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN	X	
14	ED-101	ELECTRICAL - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN	X	
15	ED-102	ELECTRICAL - EXISTING GARAGE SECOND TO SIXTH FLOOR DEMOLITION PLAN	X	
16	ED-103	ELECTRICAL - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN	X	
17	ED-104	ELECTRICAL - EXISTING GARAGE ROOF DEMOLITION PLAN	X	
18	ED-200	ELECTRICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN	X	
19	E-101	ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - POWER	X	
20	E-101A	ELECTRICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN - POWER	X	
21	E-102	ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - POWER	X	
22	E-103	ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - POWER	X	
23	E-104	ELECTRICAL - NEW GARAGE EIGHTH FLOOR PLAN - POWER	X	
24	E-105	ELECTRICAL - NEW GARAGE ROOF PLAN - POWER	X	
25	E-201	ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - LIGHTING	X	
26	E-201A	ELECTRICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN - LIGHTING	X	
27	E-202	ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - LIGHTING	X	
28	E-203	ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - LIGHTING	X	
29	E-204	ELECTRICAL - NEW GARAGE EIGHTH FLOOR PLAN - LIGHTING	X	
30	E-205	ELECTRICAL - NEW GARAGE - LIGHTING CONTROLS	X	
31	E-300	ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - GROUNDING	X	
32	E-301	ELECTRICAL - NEW GARAGE ROOF PLAN - LIGHTNING PROTECTION PLAN	X	
33	E-400	ELECTRICAL SITE PLAN	X	

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL LEAD SHEET

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E–001

EMERGENCY GENERATOR PURPOSES:

THE PURPOSE OF THE EMERGENCY GENERATOR:

A. EMERGENCY POWER ATS:
- A.A. EMERGENCY LIGHTING AND EXIT SIGNS
- A.B. FIRE ALARM SYSTEM AND ASSOCIATED ACCESSORIES
- A.C. ELEVATORS

B. OPTIONAL STANDBY ATS:
- B.A. POWER THE ELEVATORS
- B.B. HEAT TRACING
- B.C. IT EQUIPMENT
- B.D. MOTORIZED GATES

EMERGENCY GENERATOR SEQUENCES OF OPERATION:

UTILITY POWER OUTAGE:

A. UPON LOSS OF UTILITY POWER:
- A.A. THE EMERGENCY GENERATOR WILL BE ENERGIZED.
- A.B. THE EMERGENCY ATS WILL TRANSFER FROM THE NORMAL FEED TO THE GENERATOR FEED.
- A.C. EMERGENCY LOADS WILL BE ENERGIZED WITHIN 10 SECONDS OF THE LOSS OF POWER.
- A.D. AFTER THE EMERGENCY POWER LOADS ARE ENERGIZED, THE OPTIONAL STANDBY ATS WILL TRANSFER FROM THE NORMAL FEED TO THE GENERATOR FEED.
- A.E. THE OPTIONAL STANDBY LOADS SHALL BE ENERGIZED WITHIN 2 MINUTES OF THE LOSS OF POWER TO ENSURE THAT THE MDF ROOM AND IDF CLOSET UPS' WILL BE ABLE TO CARRY THROUGH THE OUTAGE WITHOUT LOSS OF POWER TO THE ASSOCIATED COMPUTER EQUIPMENT. COOLING EQUIPMENT ASSOCIATED WITH THE SERVER ROOM SHALL BE ENERGIZED WHEN THE MDF/IDF ROOM RACKS ARE ENERGIZED.
- A.F. PERSONNEL TO PERFORM AN ORDERLY EVACUATION OF THE BUILDING.

B. UPON RESTORATION OF UTILITY POWER:
- B.A. AFTER A TIME DELAY TO ENSURE THAT THE UTILITY POWER IS STABILIZED, THE OPTIONAL STANDBY ATS WILL TRANSFER FROM THE GENERATOR FEED TO THE NORMAL FEED.
- B.B. AFTER A TIME DELAY, THE EMERGENCY ATS WILL TRANSFER FROM THE GENERATOR FEED TO THE NORMAL FEED.
- B.C. THE GENERATOR SHALL RUN THROUGH THE MANUFACTURER RECOMMENDED COOLDOWN AND SHUTDOWN CYCLE.
- B.D. PROVISIONS SHALL BE PROVIDED TO ADJUST THE TIME DELAYS DESCRIBED ABOVE TO MEET AHJ SPECIFIC REQUIREMENTS.
- B.E. PERSONNEL MAY RE-OCCUPY THE BUILDING UPON APPROVAL BY THE AHJ.

UTILITY POWER OUTAGE AND ACTIVATION OF FIRE PUMP:

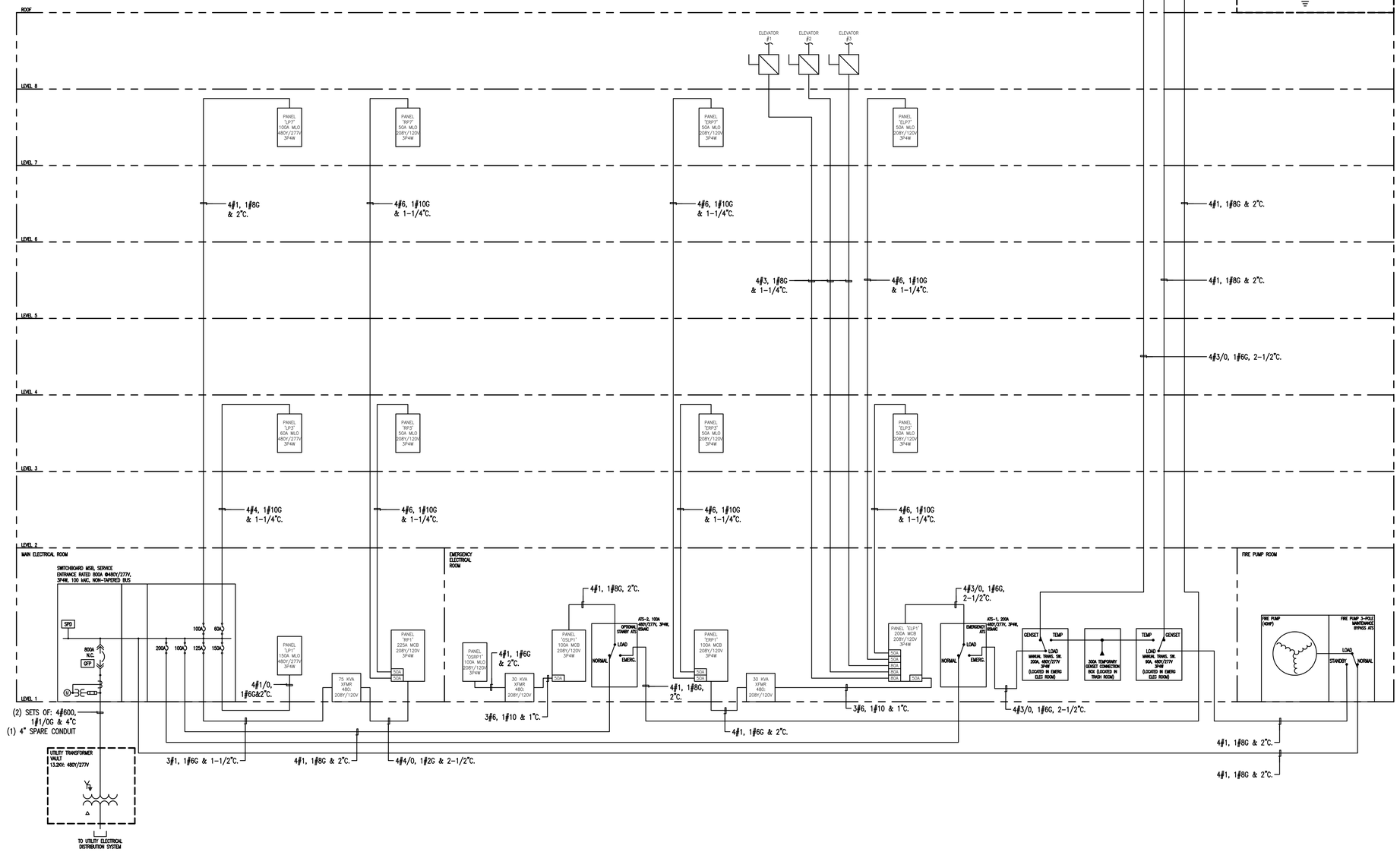
A. UPON LOSS OF UTILITY POWER:
- A.A. THE EMERGENCY GENERATOR WILL BE ENERGIZED.
- A.B. THE EMERGENCY ATS AND FIRE PUMP ATS WILL TRANSFER FROM THE NORMAL FEED TO THE GENERATOR FEED.
- A.C. EMERGENCY LOADS AND FIRE PUMP WILL BE ENERGIZED WITHIN 10 SECONDS OF THE LOSS OF POWER.
- A.D. THE OPTIONAL STANDBY ATS WILL TRANSFER TO THE OPEN POSITION AND NOT ENERGIZE THE OPTIONAL STANDBY LOADS.
- A.E. PERSONNEL TO PERFORM AN ORDERLY EVACUATION OF THE BUILDING.

B. UPON RESTORATION OF UTILITY POWER:
- B.A. AFTER A TIME DELAY TO ENSURE THAT THE UTILITY POWER IS STABILIZED, THE OPTIONAL STANDBY ATS WILL TRANSFER FROM THE OPEN POSITION TO THE NORMAL FEED.
- B.B. AFTER A TIME DELAY, THE EMERGENCY ATS AND FIRE PUMP ATS WILL TRANSFER FROM THE GENERATOR FEED TO THE NORMAL FEED.
- B.C. THE GENERATOR SHALL RUN THROUGH THE MANUFACTURER RECOMMENDED COOLDOWN AND SHUTDOWN CYCLE.
- B.D. PROVISIONS SHALL BE PROVIDED TO ADJUST THE TIME DELAYS DESCRIBED ABOVE TO MEET AHJ SPECIFIC REQUIREMENTS.
- B.E. PERSONNEL MAY RE-OCCUPY THE BUILDING UPON APPROVAL BY THE AHJ.

SELECTIVE COORDINATION ELECTRICAL NOTES

PER NEC 2017, 700.32, THE EMERGENCY ELECTRICAL SYSTEM OVERCURRENT DEVICES SHALL BE SELECTIVELY COORDINATED WITH ALL SUPPLY SIDE DEVICES. ALL NEW OVERCURRENT DEVICES TO BE PROVIDED FOR THIS PROJECT SHALL BE SELECTED IN ACCORDANCE WITH THIS NEC REQUIREMENT. PREPARE AND SUBMIT A SHORT CIRCUIT AND COORDINATION STUDY FOR THE EMERGENCY ELECTRICAL SYSTEM DETAILING THAT THE NEW DISTRIBUTION EQUIPMENT TO BE UTILIZED FOR THE PROJECT MEETS THE NEC 2017 SELECTIVE COORDINATION REQUIREMENT. SUBMIT FOR REVIEW BY THE ENGINEER PRIOR TO PURCHASING ANY NEW DISTRIBUTION EQUIPMENT. THE STUDY SHALL UTILIZE AND/OR INCLUDE THE FOLLOWING:

1. THE STUDY SHALL BE PERFORMED USING THE LATEST ANSI/IEEE STANDARDS.
2. INCLUDE A DESCRIPTION OF THE PROGRAM/ANALYSIS TOOL BEING UTILIZED FOR THE SHORT CIRCUIT AND COORDINATION STUDY.
3. THE CONTRACTOR SHALL INCLUDE IN HIS PRICE, THE INCORPORATION OF TWO REVISIONS TO THE SELECTIVE COORDINATION AND SHORT CIRCUIT STUDIES AT NO ADDITIONAL CHARGE TO THE CLIENT.
4. THE SELECTIVE COORDINATION STUDY SHALL SHOW SELECTIVE COORDINATION OF THE REQUIRED DEVICES AND PROVIDE RECOMMENDATIONS ON HOW TO ACHIEVE SELECTIVE COORDINATION. A STUDY THAT DOES NOT PROVE THAT SELECTIVE COORDINATION EXISTS, SHALL BE CONSIDERED INCOMPLETE AND WILL BE REJECTED. REVISION OF THE STUDY SHALL NOT BE INCLUDED AS ONE OF THE TWO REVISIONS DESCRIBED ABOVE.
5. THE SHORT CIRCUIT STUDY SHALL SHOW ADEQUATE WITHSTAND AND INTERRUPTING RATINGS OF ALL ELECTRICAL DISTRIBUTION EQUIPMENT THAT IS PART OF THIS STUDY. A STUDY THAT DOES NOT PROVE THAT ALL EQUIPMENT ACHIEVES ADEQUATE SHORT CIRCUIT RATINGS, SHALL BE CONSIDERED INCOMPLETE AND WILL BE REJECTED. REVISION OF THE STUDY SHALL NOT BE INCLUDED AS ONE OF THE TWO REVISIONS DESCRIBED ABOVE.
6. SUBMIT (3) COPIES OF THE STUDY FOR REVIEW BY THE ENGINEER. THE REPORT SHALL INCLUDE A ONE LINE IMPEDANCE DIAGRAM WHICH SHALL INCLUDE THE PERTINENT EQUIPMENT DATA AND IDENTIFY ALL ASSOCIATED BUSES, A LIST OF FAULT CONTRIBUTORS, A LIST OF FAULT LEVELS AT EACH BUS FOR THREE PHASE BOLTED FAULTS AND GROUND FAULTS, EQUIPMENT CONFIRMATION DATA INCLUDING FEEDER CIRCUIT LENGTH, CONFIRMATION OF EQUIPMENT INTERRUPTING RATINGS, RECOMMENDATIONS ON REQUIRED CHANGES, TIME CURRENT PLOTS WHICH GRAPHICALLY ILLUSTRATE PROTECTIVE DEVICE DESIGN PERFORMANCE VERSUS EQUIPMENT OPERATING CHARACTERISTICS WHERE APPLICABLE, AND A DETAILED LIST OF PROTECTIVE DEVICE SETTINGS.
7. SUBMIT PRIOR TO THE PURCHASE OF ANY EQUIPMENT TO ENSURE THAT THE REQUIRED INTERRUPTING CURRENT RATINGS AND DUTIES WILL BE SUSTAINED.



1 E-002 **ELECTRICAL SINGLE LINE DIAGRAM**
SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL SINGLE LINE DIAGRAM

PROJECT TITLE:

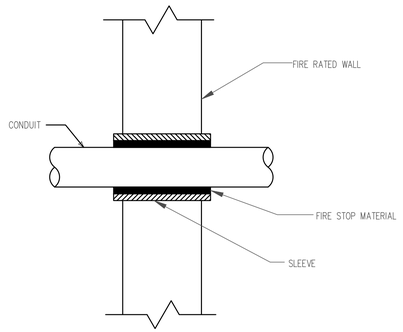
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

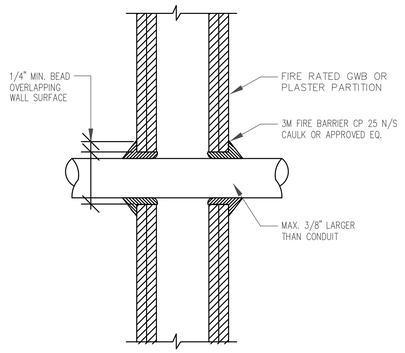
Drawing No.
E-002



1 E-003 TYPICAL CONDUIT PENETRATION DETAIL #1

SCALE: NONE

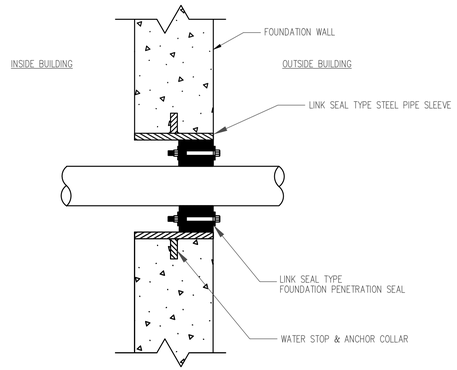
NOTES:
1. USE THIS DETAIL WHERE CONDUITS PASS THRU FIRE RATED WALL.
2. WHERE CONDUITS PASS THRU FOUNDATION WALLS, FLOOR SLAB ON EARTH, ROOF, CONCRETE BEAM, BRICK WALL, OR WATER PROOF FLOORS, USE PIPE SLEEVES.
3. FIRESTOPPING OF CONDUIT PENETRATIONS SHALL UTILIZE THE CORRECT UL STANDARD FOR THE SPECIFIC WALL/FLOOR/CEILING TYPES AND RATINGS.



2 E-003 TYPICAL CONDUIT PENETRATION DETAIL #2

SCALE: NONE

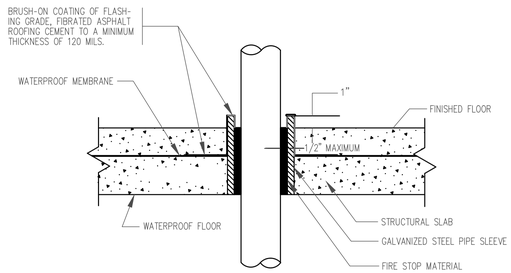
NOTES:
1. FIRESTOPPING OF CONDUIT PENETRATIONS SHALL UTILIZE THE CORRECT UL STANDARD FOR THE SPECIFIC WALL/FLOOR/CEILING TYPES AND RATINGS.



3 E-003 TYPICAL CONDUIT PENETRATION DETAIL #3

SCALE: NONE

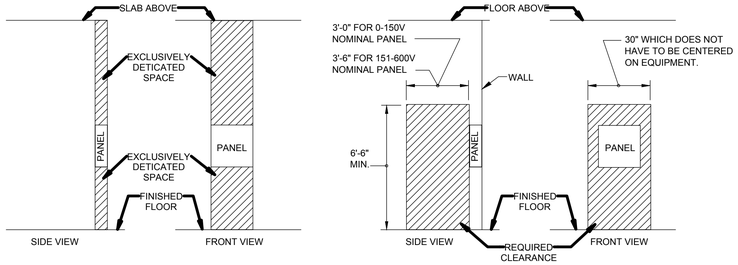
NOTES:
1. FOR SLEEVE DIAMETER USE MANUFACTURER'S SIZE RECOMMENDATION.
2. FIRESTOPPING OF CONDUIT PENETRATIONS SHALL UTILIZE THE CORRECT UL STANDARD FOR THE SPECIFIC WALL/FLOOR/CEILING TYPES AND RATINGS.



4 E-003 TYPICAL CONDUIT PENETRATION DETAIL #4

SCALE: NONE

NOTES:
1. USE THIS DETAIL WHERE CONDUITS PENETRATE A WATERPROOF SLAB, EG, TOILETS, BATHROOMS, KITCHENS JANITORS CLOSET, ETC.
2. FIRE STOPPING OF CONDUIT PENETRATIONS SHALL UTILIZE THE CORRECT UL STANDARD FOR THE SPECIFIC WALL/FLOOR/CEILING TYPES AND RATINGS.

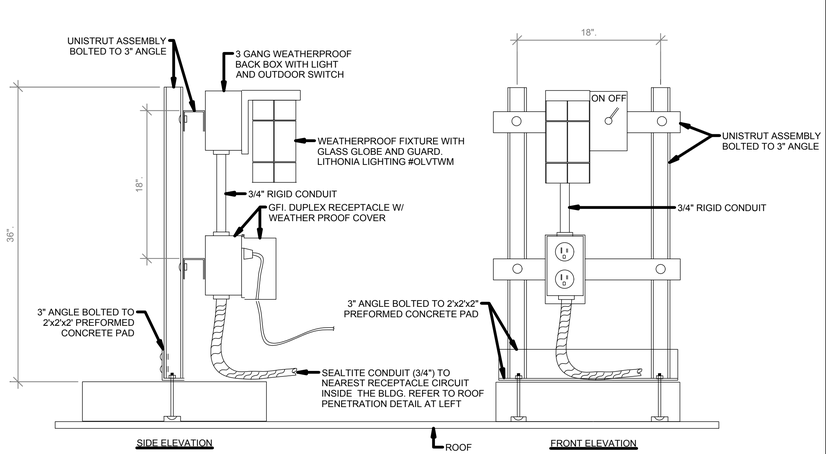


NOTE:

1. DISTANCE FROM FACE OF EQUIPMENT PER NEC 110.26 (A)(1): 3'-0" MINIMUM CLEARANCE FOR ELECTRICAL EQUIPMENT AT 208Y/120V. 3'-6" MINIMUM CLEARANCE FOR ELECTRICAL EQUIPMENT AT 480Y/277V. NOTE: MINIMUM CLEARANCE INCREASED TO 4'-0" IF THERE ARE EXPOSED LIVE PARTS ON BOTH SIDE OF THE WORKING SPACE. ELECTRICAL EQUIPMENT DOOR MUST BE ABLE TO OPEN TO 90 DEGREES MINIMUM.
2. DEDICATED EQUIPMENT SPACE, ABOVE AND BELOW THE ELECTRICAL EQUIPMENT, SHALL BE PROVIDED AS DESCRIBED IN NEC 110.26(E)(1). THE SPACE EQUAL TO THE WIDTH AND DEPTH OF THE EQUIPMENT AND EXTENDING FROM THE FLOOR TO A HEIGHT OF 6'-0" ABOVE THE EQUIPMENT OR TO THE STRUCTURAL CEILING, WHICHEVER IS LOWER, SHALL BE DEDICATED TO THE ELECTRICAL INSTALLATION. NO PIPING, DUCTS, LEAK PROTECTION APPARATUS, OR OTHER EQUIPMENT FOREIGN TO THE ELECTRICAL INSTALLATION SHALL BE LOCATED IN THIS ZONE. SEE NEC 110.26 FOR EXCEPTIONS AND FURTHER INFORMATION.

5 E-003 TYPICAL PANELBOARD CLEARANCES

SCALE: NONE



6 E-003 TYPICAL ROOF MOUNTED RECEPT W/LIGHT

SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL DETAILS

PROJECT TITLE:

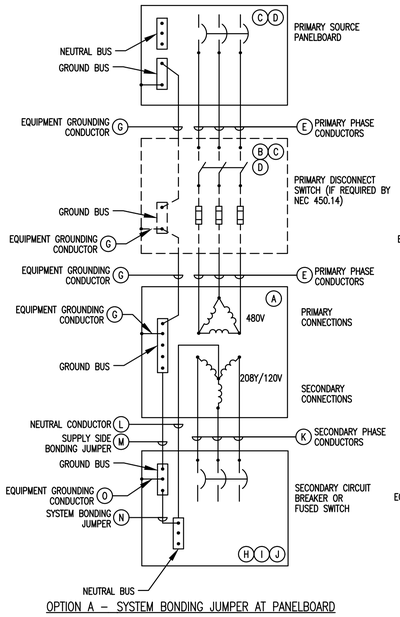
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

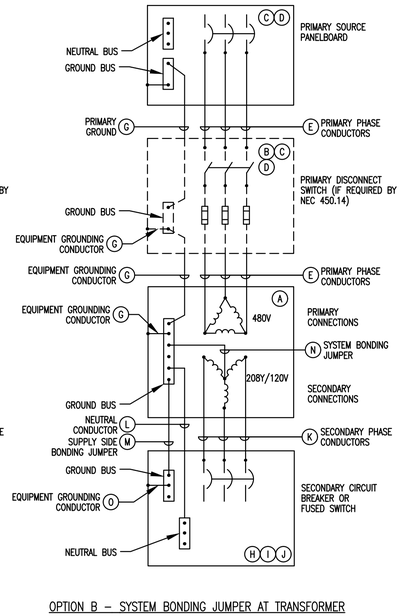
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-003



OPTION A – SYSTEM BONDING JUMPER AT PANELBOARD



OPTION B – SYSTEM BONDING JUMPER AT TRANSFORMER

DRY TYPE TRANSFORMER SCHEDULE

PRIMARY VOLTAGE – 480V DELTA								SECONDARY VOLTAGE – 208Y/120V, 3 PHASE, 4 WIRE WYE								
	PRIMARY DISC. SW. FUSE SIZE/ BRKR. TRIP (AMPS) & FEEDER							SECONDARY DISC. SW. FUSE SIZE/ BRKR. TRIP (AMPS), FEEDER, GROUNDING/BONDING								
XFMR SIZE (KVA)	DISC. SW. FRAME	POLES	CB AND/OR FUSE TRIP	FEEDER				DISC. SW. FRAME	POLES	CB AND/OR FUSE TRIP	FEEDER				SYSTEM BONDING JUMPER	SECONDARY EQUIPMENT GROUNDING CONDUCTOR
				PHASES	NEUTRAL (GROUNDED CONDUCTOR)	PRIMARY EQUIPMENT GROUNDING CONDUCTOR	CONDUIT				PHASES	NEUTRAL (GROUNDED CONDUCTOR)	SUPPLY SIDE BONDING JUMPER	CONDUIT		
A (NOTE 1)	B (NOTE 2)	C	D (NOTE 3)	E (NOTE 4)	F	G (NOTE 5)	(NOTE 6)	H	I	J	K	L	M		N	O
30	60	3	50	3#6		1#10	1"	100	3	100	3#1	1#1	1#6	2"	1#6	1#8

NOTES FOR DRY TYPE TRANSFORMER SCHEDULE:

1. PROVIDE FUSED DISCONNECT SWITCH/ENCLOSED CIRCUIT BREAKER AT TRANSFORMER PRIMARY AS REQUIRED BY NEC 450.14.
2. PROVIDE SECONDARY FUSED DISCONNECT SWITCH/ENCLOSED CIRCUIT BREAKER WITHIN 10 FEET OF TRANSFORMER ON THE SECONDARY SIDE. SEE NEC 240.21(C)(2).
3. SEPARATELY DERIVED SYSTEM GROUNDING ELECTRODE CONDUCTOR SHALL BE CONNECTED TO THE GROUNDING ELECTRODE SYSTEM PER NEC 250.30(A)(4).
4. TRANSFORMER PRIMARY SIDE CIRCUIT BREAKERS SHALL BE SOLID STATE TO ALLOW ADJUSTMENT TO ACCOMMODATE DOE 2016 INRUSH CURRENTS. CONTRACTORS SHALL PROVIDE TIME CURRENT CURVE SHOWING THE TRANSFORMER INRUSH CURRENT AND THE CIRCUIT BREAKER TRIP SETTING. CONTRACTOR IS RESPONSIBLE FOR COORDINATING PRIMARY SIDE BREAKER/FUSE WITH TRANSFORMER INRUSH CURRENT.
5. ALL CONDUCTORS ARE TO BE COPPER.
6. TRANSFORMERS INSTALLED INDOORS OVER 112.5 KVA SHALL BE IN A TRANSFORMER ROOM OF FIRE-RESISTANT CONSTRUCTION (HAVING A MINIMUM FIRE RATING OF 1 HOUR) PER NEC 450.21(B).

1 / E-004 TYPICAL 480-208Y/120V TRANSFORMER CONNECTION DETAIL

SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL DETAILS

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

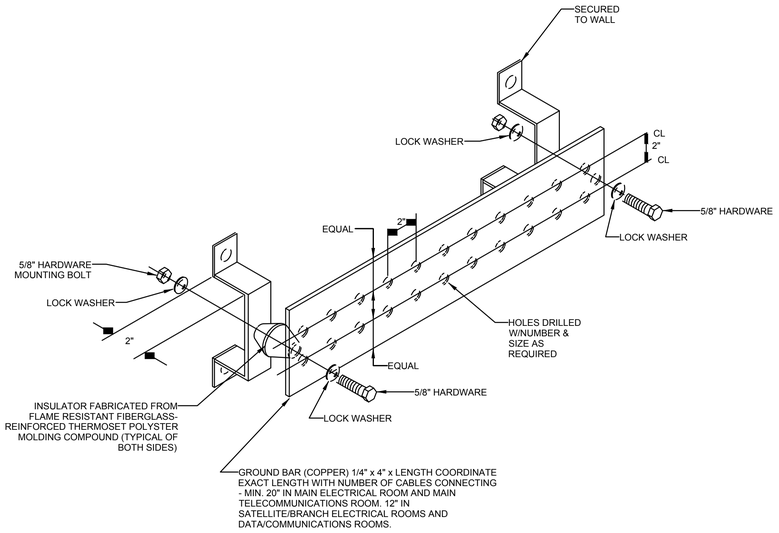
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

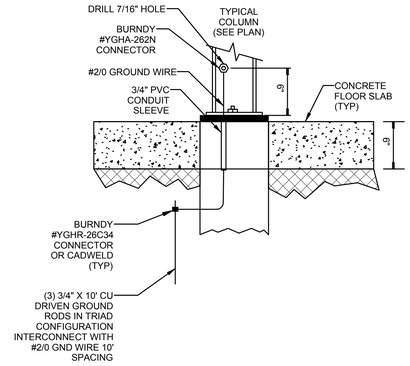
Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

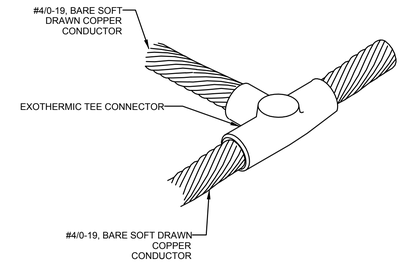
E-004



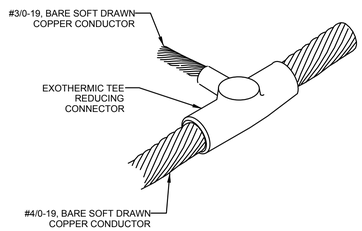
1 E-005 **GROUND BAR DETAIL – TYPICAL**
SCALE: NONE



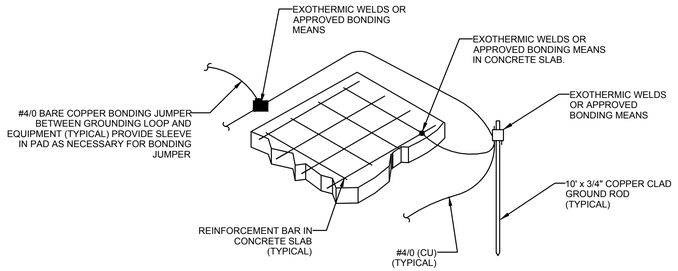
2 E-005 **TYPICAL STEEL COULMN GROUNDING**
SCALE: NONE



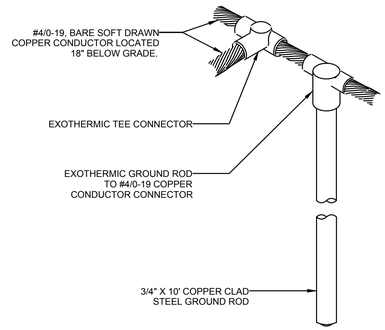
3 E-005 **GROUNDING TEE DETAIL**
SCALE: NONE



4 E-005 **EQUIPMENT GROUNDING TAP DETAIL**
SCALE: NONE



5 E-005 **TYPICAL FOUNDATION PAD GROUNDING DETAIL**
SCALE: NONE



6 E-005 **TYPICAL GROUNDING ROD DETAIL**
SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL GROUNDING DETAILS

PROJECT TITLE:

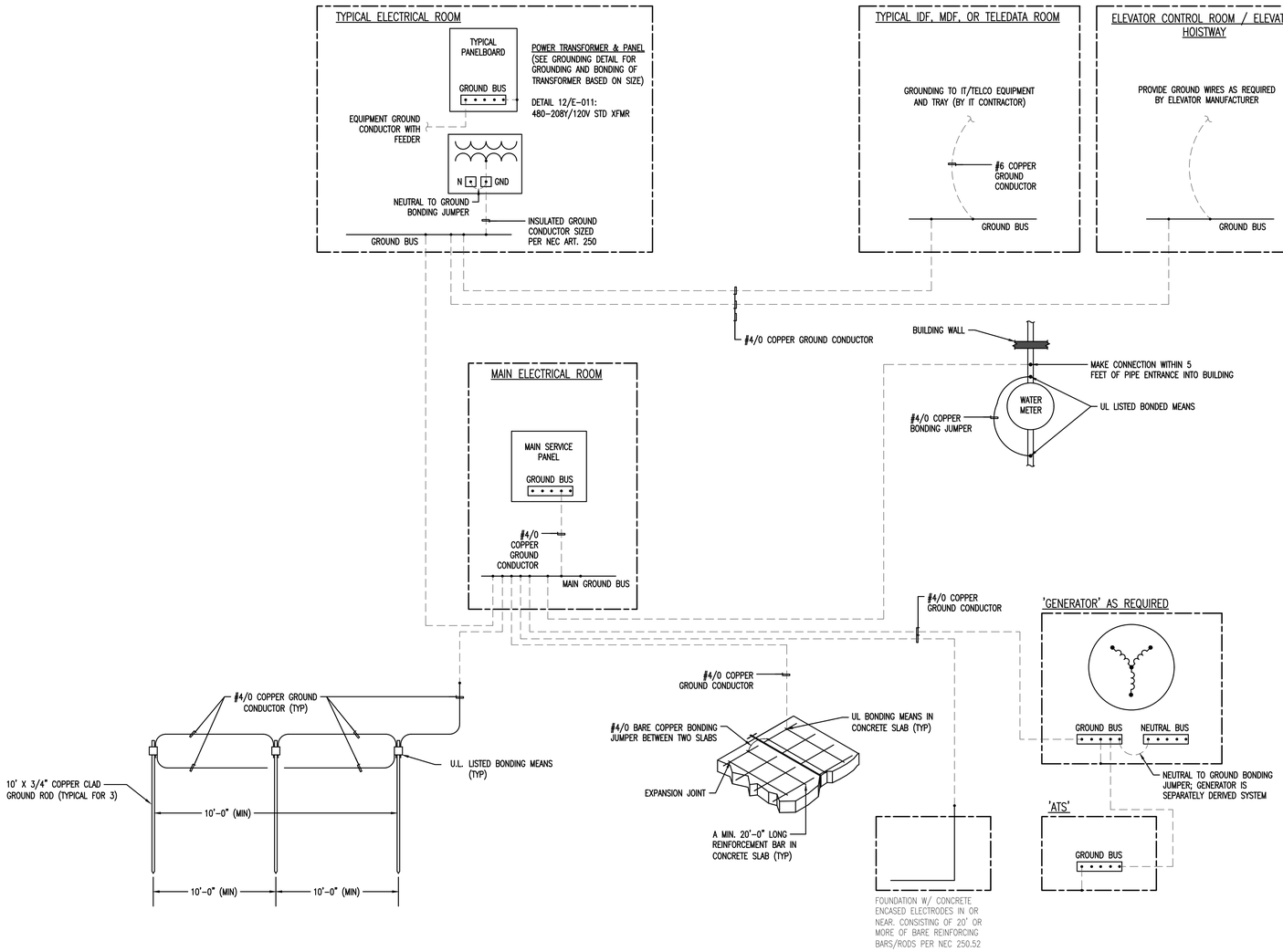
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-005



1 E-006 **TYPICAL GROUND BUS AND EQUIPMENT GROUNDING**
SCALE: NONE

GROUNDING NOTES:

1. GROUNDING SYSTEM DIAGRAM IS TYPICAL AND IS INTENDED TO DEPICT THE GROUNDING AND BONDING OF THE BUILDING ELECTRICAL DISTRIBUTION SYSTEM. ELECTRICAL CONTRACTOR SHALL APPLY THE MEANS AND METHODS SHOWN FOR THE ACTUAL BUILDING DISTRIBUTION SYSTEM WHERE APPLICABLE. ALL GROUNDING SYSTEM EQUIPMENT AND MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE – 2017.
2. THE GROUNDING ELECTRODE SYSTEM FOR THE BUILDING SHALL INCLUDE THE CONNECTION TO A MAIN METAL WATER PIPING SYSTEM, A DRIVEN GROUND ROD, A CONNECTION TO THE BUILDING STEEL, AND CONNECTION TO A CONCRETE ENCASED ELECTRODE.
3. REFER TO THE BUILDING SINGLE LINE DIAGRAM AND NEC 250.66 FOR THE SELECTED SIZE OF THE GROUNDING ELECTRODE CONDUCTOR.
4. THE GROUNDING ELECTRODE CONDUCTOR SHALL BE AN INSULATED COPPER CONDUCTOR GREEN IN COLOR.
5. GROUNDED NEUTRAL CONDUCTORS SHALL BE AN INSULATED COPPER CONDUCTOR GRAY OR WHITE IN COLOR.
6. EQUIPMENT GROUNDING CONDUCTORS SHALL BE AN INSULATED COPPER CONDUCTOR GREEN IN COLOR.
7. BONDING JUMPERS WHERE REQUIRED PER THE NEC SHALL BE COPPER CONDUCTORS. BONDING JUMPERS LESS THAN SIX FEET IN LENGTH MAY BE BARE CONDUCTORS. JUMPERS LONGER THAN SIX FEET IN LENGTH SHALL BE INSTALLED IN RACEWAY AND SHALL BE INSULATED CONDUCTORS GREEN IN COLOR.
8. REFER TO THE NATIONAL ELECTRICAL CODE TABLE 250.122 FOR EQUIPMENT GROUNDING CONDUCTOR SIZING. WHERE NOT INDICATED IN THE GROUNDING SYSTEM DIAGRAM OR SHOWN ON THE BUILDING SINGLE LINE DIAGRAM.
9. THE ELECTRICAL CONTRACTOR SHALL PROVIDE GROUNDING OF THE BUILDING STRUCTURAL STEEL IN ACCORDANCE THE PROJECT SPECIFICATIONS AND THE STRUCTURAL COLUMN GROUNDING SHOWN ON THE POWER PLANS.
10. INSTALL GROUNDING ELECTRODE SYSTEM PER NEC 250.53.
11. PER NEC 250.58, WHERE AN AC SYSTEM IS CONNECTED TO A GROUNDING ELECTRODE IN OR AT A BUILDING OR STRUCTURE, THE SAME ELECTRODE SHALL BE USED TO GROUND CONDUCTOR ENCLOSURES AND EQUIPMENT IN OR ON THAT BUILDING OR STRUCTURE. WHERE SEPARATE SERVICES, FEEDERS, OR BRANCH CIRCUITS SUPPLY A BUILDING AND ARE REQUIRED TO BE CONNECTED TO A GROUNDING ELECTRODE(S), THE SAME GROUNDING ELECTRODE(S) SHALL BE USED. TWO OR MORE GROUNDING ELECTRODES THAT ARE BONDED TOGETHER SHALL BE CONSIDERED AS A SINGLE GROUNDING ELECTRODE SYSTEM IN THIS SENSE.
12. EXPOSED, NORMALLY NON-CURRENT-CARRYING METAL PARTS OF FIXED EQUIPMENT SUPPLIED BY OR ENCLOSING CONDUCTORS OR COMPONENTS THAT ARE LIKELY TO BECOME ENERGIZED SHALL BE CONNECTED TO AN EQUIPMENT GROUNDING CONDUCTOR AS REQUIRED BY NEC 250.110.
13. PIPING SYSTEMS AND EXPOSED STRUCTURAL METAL SHALL BE BONDED AS REQUIRED BY NEC 250.104.
14. THE LIGHTNING PROTECTION SYSTEM GROUND TERMINALS SHALL BE BONDED TO THE BUILDING OR STRUCTURE GROUNDING ELECTRODE SYSTEM AS REQUIRED BY NEC 250.106. SEE DRAWING E-503 FOR FURTHER INFORMATION.
15. PROVIDE BONDING JUMPER BETWEEN COLD AND HOT WATER PIPING AT EACH WATER HEATER.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL GROUNDING DIAGRAM

PROJECT TITLE:

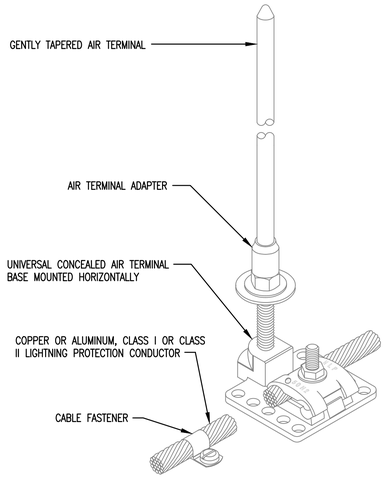
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

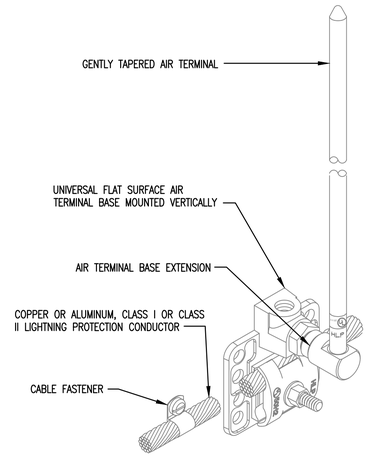
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

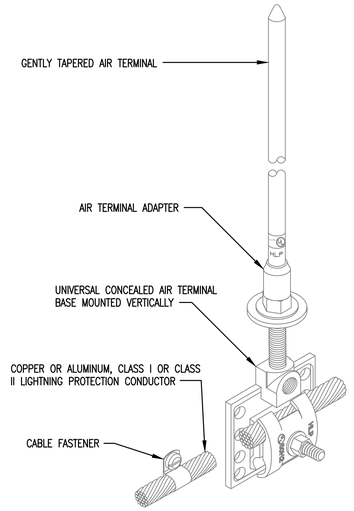
Drawing No.
E-006



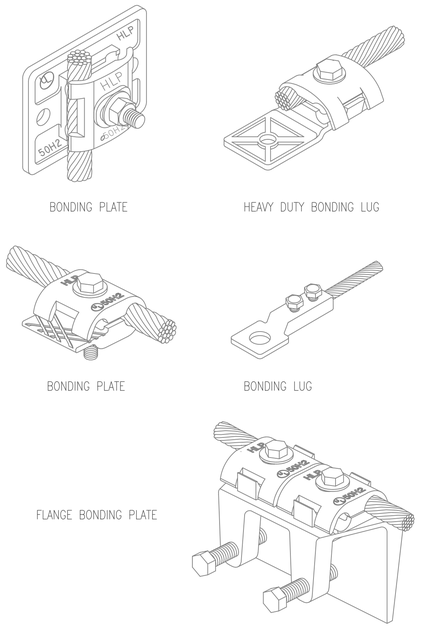
1 E-007 **TYPICAL HORIZONTAL AIR TERMINAL BASE DETAIL**
SCALE: NONE



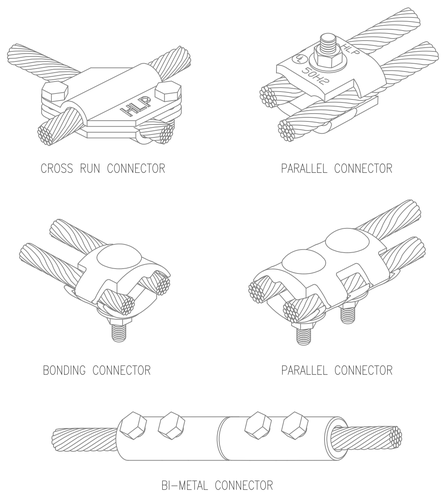
2 E-007 **TYPICAL AIR TERMINAL BASE EXTENSION DETAIL**
SCALE: NONE



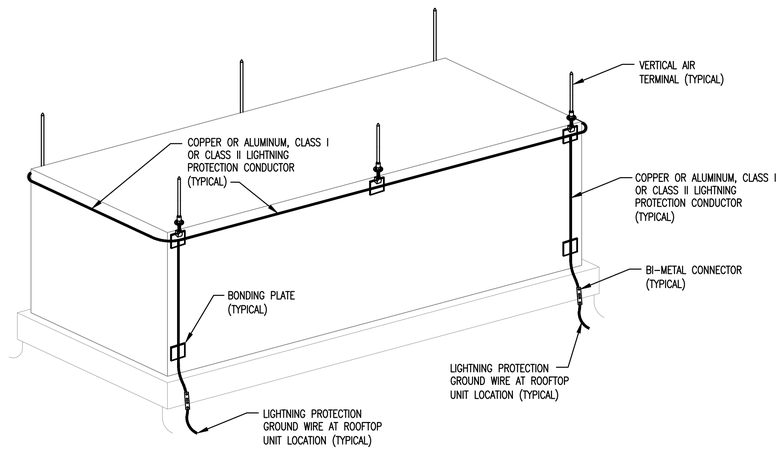
3 E-007 **TYPICAL VERTICAL AIR TERMINAL BASE EXTENSION**
SCALE: NONE



4 E-007 **TYPICAL BONDING LUGS AND PLATES**
SCALE: NONE



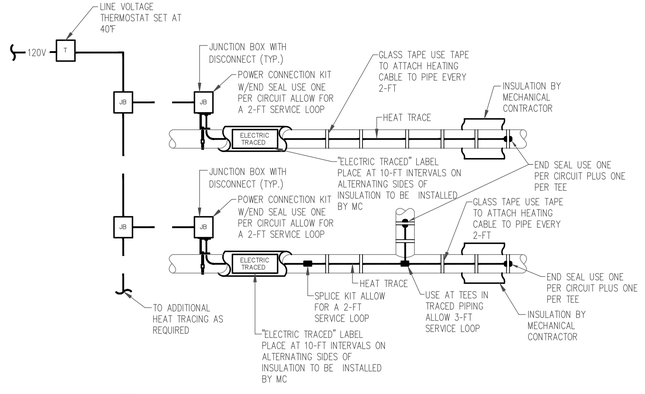
5 E-007 **TYPICAL CABLE CONNECTORS**
SCALE: NONE



6 E-007 **TYPICAL ROOF TOP UNIT LIGHTNING PROTECTION MODIFICATION DETAIL**
SCALE: NONE

LIGHTNING PROTECTION SYSTEM NOTE:

1. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A COMPLETE LIGHTNING PROTECTION SYSTEM FOR ALL AFFECTED ROOFTOP EQUIPMENT. ALL EQUIPMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE NATIONAL FIRE PROTECTION ASSOCIATION ARTICLE 780 AND UL STANDARD 96A. ALL LIGHTNING PROTECTION EQUIPMENT SHALL BE NEW AND LABLED. INSTALLATION SHALL BE PERFORMED BY OR UNDER THE SUPERVISION OF A CERTIFIED MASTER INSTALLER. SHOP DRAWINGS SHOWING THE SIZE AND LOCATION OF ALL EQUIPMENT SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE START OF WORK.



7 E-007 **TYPICAL HEAT TRACE DETAIL**
SCALE: NONE

NOTES:
1. ALL CONDUIT, WIRE, JUNCTION BOXES, ETC. TO BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
2. HEAT TRACING FOR ALL PIPING TO BE RAYCHEM MODEL 5XL-CR/CT WITH POWER CONNECTION KITS, SPLICE KITS AND GLASS TAPE AS REQUIRED. HEAT TRACE TO BE FM APPROVED.
3. E.C. SHALL ASSURE THAT THE HEAT TRACE INSTALLATION CONFORMS TO NEC. ARTICLE 427.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL LIGHTNING PROTECTION DETAILS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-007

LUMINAIRE SCHEDULE

FIXTURE TYPE	DESCRIPTION	MANUFACTURER & MODEL	CATALOG NUMBER	MOUNTING REC.	MOUNTING SURF.	MOUNTING SUSP.	MOUNTING POLE	LAMP TYPE AND VOLTAGE	WATTAGE	COLOR TEMPERATURE	REMARKS
A	19" DIAMETER SURFACE MOUNTED LED PARKING GARAGE FIXTURE	BEACON, SRT2	SRT2-85-4K8-5QW-UNV-LGS-LD6-UD-NXWE		X			LED-UNV	43	4000K	ALTERNATE FIXTURE: CREE #IG-B-NM-5S-4L-CCT-UL-WH-LRF
A1	TBD	TBD	TBD					LED-UNV	TBD	TBD	ALTERNATE FIXTURE: CREE #IG-B-NM-5S-7L-CCT-UL-WH-LRF
B	2X2 RECESSED LED LIGHT FIXTURE	COLUMBIA LIGHTING, LCAT22	LCAT22-40LVG-ED1-U-NXWE	X				LED-UNV	49	4000K	ALTERNATE FIXTURE: CREE #ZR22-50L-835-VRF-UNV
C	PENDANT MOUNTED LED FIXTURE	KENALL, EPLB	ELPB-12-E-XX-PPA-XXX-42L-40K8-DCC-XXX-J9			X		LED-UNV	61	4000K	ALTERNATE FIXTURE: CREE #IG-PDWH + IG-B-NM-5S-4L-CCT-UL-WH-LRF
D	WALL/CEILING MOUNTED LED LIGHT FIXTURE	KENALL, MLHA8	MLHA8-48-F-MW-PP-1-67L40K-DCC-1-GV-CDF-MS-9500		X			LED-UNV	30	4000K	ALTERNATE FIXTURE: LIGHT EFFICIENT DESIGN #RPT-P-LIVC-4FT-20L-840-FWFC-EMG-SENSOR-R-S1 + RPT-LIVC-G2-ENDCAP-SECURITY1
E	PENDANT MOUNTED LED LIGHT FIXTURE	COLUMBIA LIGHTING, MPS4	MPS4-40ML-CP-W-E-U-NXWE			X		LED-UNV	40	4000K	ALTERNATE FIXTURE: CREE #LS4C-50L-CCT-10V-FD + ACCESSORIES
E2	PENDANT MOUNTED LED LIGHT FIXTURE	COLUMBIA LIGHTING, MPS4	MPS4-40VL-CP-W-E-U-NXWE			X		LED-UNV	40	4000K	ALTERNATE FIXTURE: CREE #LS4C-50L-CCT-10V-FD + ACCESSORIES
F	ELEVATOR SHAFT LIGHT	COLUMBIA, LXEN4	LXEN4-40LW-RFA-EU		X			LED-UNV	33.8W	4000K	COORDINATE FINAL FIXTURE SELECTION WITH PROPERTY OWNER/ARCHITECT.
X1	CEILING / WALL MOUNTED EXIT SIGN	KENALL, MILLENIUM METREX	TBD		X			LED-UNV	6.5	TBD	ALTERNATE FIXTURE: ISOLITE #HZN-(BATTERY TYPE)-(OPERATION)-L-(LAMP VOLTAGE)-SD

Panel MSB

Panel:	MSB
Location:	BASEMENT
Fed From:	UTILITY
Voltage:	480Y/277V, 3P4W
Main Config:	MCB; Main Amps: 800
Bus Rating:	800
Bus Matl:	CU
NEMA:	1
Mounting:	Surface
Panel Info:	

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	0	Demand Amps:	0			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Remarks
1	LP1	#VALUE!	3	####	#VALUE!	
2	LP3	10,710	3	60	4#4, 1#10G, 1-1/4"C	
3	LP7	28,999	3	100	4#1, 1#8G, 1-1/2"C	
4	ELP1 (VIA ATS-1)	118,506	1	200	2#3/0, 1#6G, 1-1/4"C	
5	RP1	34,064	3	125	3#1, 1#6G, 1-1/2"C	
6	OSLP1 (VIA ATS-2)	23,614	3	100	4#1, 1#8G, 2"C	
7						
8						
9						
10	FIRE PUMP	41,429			4#1, 1#8G, 2"C	LOCATED IN FIRE TAP SECTION

Total Connected Load: #VALUE! VA
Total Connected Amps: #VALUE! A

Warning:The load category information has not been entered for all circuits.
\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]MSB

COMMERCIAL LOAD SUMMARY FOR MSG

BLDG Area: 175000 Sq. Ft. 480 VAC 3 Phase

Load Description		(VA)		Demand Factor		Demand Load	
General Lighting Load (Actual)							
	Interior	#VALUE!	x	125%	=	#VALUE!	VA
	Exterior		x	125%	=		VA
	Signage	1200	x	125%	=	1500	VA
Minimum Lighting Load (T220.3A		87500	x	125%	=	#VALUE!	VA
Receptacle Load		12600					VA
	1st 10 kVA	10000	x	100%	=	10000	VA
	Over 10 kVA	2600	x	50%	=	1300	VA
Minimum Recept Load (220.14K			x	100%	=		VA
General Power Load					=		VA
	Continuous	16150	x	125%	=	20188	VA
	Non-continuous	11725	x	100%	=	11725	VA
Motors		114082	x	100%	=	114082	VA
Largest Motor	40.00 HP	41440	x	25%	=	10360	VA
Electric Space Heating			x	100%	=		VA
Kitchen Equipment							VA
	1		x	100%	=		VA
	2		x	100%	=		VA
	3		x	90%	=		VA
	4		x	80%	=		VA
	5		x	70%	=		VA
	6 and over		x	65%	=		VA
Non-coincident Loads			x		=		VA
HVAC Equipment		74046	x	100%	=	74046	VA
Largest HVAC Load		17459	x	25%	=	4365	VA
Arc Welders							VA
	1st Largest		x	100%	=		VA
	2nd Largest		x	100%	=		VA
	3rd Largest		x	85%	=		VA
	4th Largest		x	70%	=		VA
	5th and over		x	60%	=		VA
Cranes or Hoists							VA
	1		x	100%	=		VA
	2		x	95%	=		VA
	3		x	91%	=		VA
	4		x	87%	=		VA
	5		x	84%	=		VA
	6		x	81%	=		VA
	7 and over		x	78%	=		VA
				Sub-Total :		#VALUE!	VA
				Total Demand Load :		#VALUE!	kVA
				Minimum Service Size :		#VALUE!	Amps

Panel ELP1

Panel:	ELP1
Location:	1ST FLR
Fed From:	MSB
Voltage:	480Y/277V, 3P4W
Main Config:	MCB; Main Amps: 200
Bus Rating:	200
Bus Matl:	
NEMA:	1
Mounting:	Surface
Panel Info:	FEEDS BASEMENT, 1ST & 2ND

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	0	Demand Amps:	0			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Breaker Trip	Breaker P	Load VA	Load Description	Ckt #
1	EM LIGHTING - STORAGE 114	280	1	20	2#12, 1#12G, 3/4"C	580	0	0	2#12, 1#12G, 3/4"C	20	1	300	EM LIGHTING - NE STAIR TOWER	2
3	EM LIGHTING - 1ST FLR	1,910	1	20	2#12, 1#12G, 3/4"C	0	2,270	0	2#12, 1#12G, 3/4"C	20	1	360	EM LIGHTING -SW STAIR TOWER	4
5	EM LIGHTING - 2ND FLR	967	1	20	2#12, 1#12G, 3/4"C	0	0	967			1		SPARE	6
7		792	3	50	4#6, 1#10G, 1"C	1,784	0	0	4#6, 1#10G, 1"C	50	3	992		8
9	PANEL ELP3	792	-			0	1,584	0			-	792	PANEL ELP7	10
11		792	-			0	0	1,486			-	694		12
13		1,896	3	50	4#6, 1#10G, 1"C	12,981	0	0	4#3, 1#8G, 1-1/4"C	80	3	11,085		14
15	PANEL ERP1	3,246	-			0	14,331	0			-	11,085	ELEV. #1	16
17		1,800	-			0	0	12,885			-	11,085		18
19		11,085	3	80	4#3, 1#8G, 1-1/4"C	22,170	0	0	4#3, 1#8G, 1-1/4"C	80	3	11,085		20
21	ELEV. #2	11,085	-			0	22,170	0			-	11,085	ELEV. #3	22
23		11,085	-			0	0	22,170			-	11,085		24
25	EM LIGHTING - 1ST FLR ELEV PITS	100	1	20	2#12, 1#12G, 3/4"C	100	0	0		20	1		SPARE	26
27		1,009	3	20	4#12, 1#12G, 3/4"C	0	1,009	0		20	1		SPARE	28
29	NITROGEN GENERATOR	1,009	-			0	0	1,009		20	1		SPARE	30
31		1,009	-			1,009	0	0		20	1		SPARE	32
33	SPARE		1	20		0	0	0		20	1		SPARE	34
35	SPARE		1	20		0	0	0		20	1		SPARE	36
37	SPARE		1	20		0	0	0		20	1		SPARE	38
39	SPARE		1	20		0	0	0		20	1		SPARE	40
41	SPARE		1	20		0	0	0		20	1		SPARE	42
						38,625	41,364	38,517	VA					
									VA (Sub-Feed)					
						38,625	41,364	38,517	VA (Total)					
						139	149	139	Amperage					

Total Connected Load: 118,506 VA
Total Connected Amps: 143 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ELP1

Panel LP1

Panel:	LP1
Location:	1ST FLR
Fed From:	MSB
Voltage:	480Y/277V, 3P4W
Main Config:	MLO; Main Amps:
Bus Rating:	150
Bus Matl:	CU
NEMA:	1
Mounting:	Surface
Panel Info:	FEEDS 1ST & 2ND

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	#VALUE!	1.25	#VALUE!			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	4,155	1.00	4,155
Motors:	2,588	1.00	2,588	1,673	0.25	418
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	23,942	1.00	23,942	5,986	0.25	1,496
Demand VA:	#VALUE!	Demand Amps:	#VALUE!			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Breaker Trip	Breaker P	Load VA	Load Description	Ckt #
1	SPARE		1	20		300	0	0	2#12, 1#12G, 3/4"C	20	1	300	LIGHTING - NE STAIR TOWER	2
3	LIGHTING - 1ST FLR	2,336	1	20	2#12, 1#12G, 3/4"C	0	2,696	0	2#12, 1#12G, 3/4"C	20	1	360	LIGHTING - SW STAIR TOWER	4
5	LIGHTING - 2ND FLR	what	1	#N/A	#N/A	0	0	#VALUE!	2#12, 1#12G, 3/4"C	20	1	4,155	WATER HEATER - SHERIFF	6
7		998	3	15	4#12, 1#12G, 3/4"C	1,995	0	0	4#12, 1#12G, 3/4"C	15	3	998		8
9	UH-1 - MAIN ELEC RM	998	-			0	1,995	0			-	998	UH-2 - FIRE PUMP RM	10
11		998	-			0	0	1,995			-	998		12
13		998	3	15	4#12, 1#12G, 3/4"C	1,995	0	0	4#12, 1#12G, 3/4"C	15	3	998		14
15	UH-3 - FIRE PUMP RM	998	-			0	1,995	0			-	998	UH-6 - 2ND FLR	16
17		998	-			0	0	1,995			-	998		18
19	SPARE		1	20		1,995	0	0	4#12, 1#12G, 3/4"C	15	3	1,995		20
21	SPARE		1	20		0	1,995	0			-	1,995	UH-4 & UH-5 - STORAGE RM 114	22
23	SPARE		1	20		0	0	1,995			-	1,995		24
25	SPARE		1	20		0	0	0		20	1		SPARE	26
27	SPARE		1	20		0	0	0		20	1		SPARE	28
29	SPARE		1	20		0	0	0		20	1		SPARE	30
31	SPARE		1	20		2,992	0	0	2#12, 1#12G, 3/4"C	20	1	2,992	CUH-1 - SHERIFF	32
33	SPARE		1	20		0	280	0	2#12, 1#12G, 3/4"C	20	1	280	LIGHTING - STORAGE 114	34
35	SPARE		1	20		0	0	0		20	1		SPARE	36
37		558	3	20	4#12, 1#12G, 3/4"C	863	0	0	4#12, 1#12G, 3/4"C	15	3	305		38
39	JOCKEY PUMP	558	-			0	863	0			-	305	EF-6 - STORAGE RM 114	40
41		558	-			0	0	863			-	305		42
43	SPARE		1	20		998	0	0	4#12, 1#12G, 3/4"C	15	3	998		44
45	SPARE		1	20		0	998	0			-	998	UH-2 - EMER ELEC RM	46
47	SPARE		1	20		0	0	998			-	998		48
49	SPARE		1	20		0	0	0		20	1		SPARE	50
51	SPARE		1	20		0	0	0		20	1		SPARE	52
53	SPARE		1	20		0	0	0		20	1		SPARE	54
									VA (Sub-Feed)					
						13,926	13,611	#VALUE!	VA (Total)					
						50	49	#VALUE!	Amperage					

Total Connected Load: #VALUE! VA
Total Connected Amps: #VALUE! A
Notes:

Warning:The load category information has not been entered for all circuits.
\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]LP1

Panel ERP1

Panel:	ERP1
Location:	1ST FLR
Fed From:	RPB
Voltage:	208Y/120V, 3P4W
Main Config:	Main Amps:
Bus Rating:	
Bus Matl:	
NEMA:	1
Mounting:	Surface
Panel Info:	FEEDS BASEMENT, 1ST & 2ND

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	0	Demand Amps:	0			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Breaker Trip	Breaker P	Load VA	Load Description	Ckt #
1	CODE BLUE - SITE	200	1	20	2#12, 1#12G, 3/4"C	400	0	0	2#12, 1#12G, 3/4"C	20	1	200	ELEV #2 CAR LTG	2
3	ELEV #1 CAR LTG	200	1	20	2#12, 1#12G, 3/4"C	0	400	0	2#12, 1#12G, 3/4"C	20	1	200	ELEV #3 CAR LTG	4
5	SW CODE BLUE - 1ST FLR	200	1	20	2#12, 1#12G, 3/4"C	0	0	500	2#12, 1#12G, 3/4"C	20	1	300	HEAT TRACE - FIRST FLOOR	6
7	NE CODE BLUE - 1ST FLR	200	1	20	2#12, 1#12G, 3/4"C	200	0	0			1		SPARE	8
9	LOBBY CODE BLUE - 1ST FLR	200	1	20	2#12, 1#12G, 3/4"C	0	450	0	2#12, 1#12G, 3/4"C	20	1	250	REMOTE ANN PANEL	10
11	SW CODE BLUE - 2ND FLR	200	1	20	2#12, 1#12G, 3/4"C	0	0	700	2#12, 1#12G, 3/4"C	20	1	500	FIRE ALARM CONTROL PANEL	12
13	NE CODE BLUE - 2ND FLR	200	1	20	2#12, 1#12G, 3/4"C	200	0	0		20	1		SPARE	14
15	LOBBY CODE BLUE - 1ST FLR	200	1	20	2#12, 1#12G, 3/4"C	0	1,700	0	2#12, 1#12G, 3/4"C	20	1	1,500	FM200 - 1ST FLR SHERIFF	16
17	SPARE		1	20		0	0	0		20	1		SPARE	18
19		600	3	50	4#6, 1#10G, 1"C	600	0	0		20	1		SPARE	20
21	PANEL ERP4	400	-			0	400	0		20	1		SPARE	22
23		200	-			0	0	200		20	1		SPARE	24
25		496	3	50	4#6, 1#10G, 1"C	496	0	0		20	1		SPARE	26
27	PANEL ERP7	296	-			0	296	0		20	1		SPARE	28
29		400	-			0	0	400		20	1		SPARE	30
31	SPARE		1	20		0	0	0		20	1		SPARE	32
33	SPARE		1	20		0	0	0		20	1		SPARE	34
35	SPARE		1	20		0	0	0		20	1		SPARE	36
37	SPARE		1	20		0	0	0		20	1		SPARE	38
39	SPARE		1	20		0	0	0		20	1		SPARE	40
41	SPARE		1	20		0	0	0		20	1		SPARE	42
						1,896	3,246	1,800	VA					
									VA (Sub-Feed)					
						1,896	3,246	1,800	VA (Total)					
						16	27	15	Amperage					

Total Connected Load: 6,942 VA
Total Connected Amps: 19 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ERP1

Panel RP1

Panel:	RP1
Location:	1ST FLR
Fed From:	MSB (VIA 75KVA XFMR)
Voltage:	208Y/120V, 3P4W
Main Config:	MCB; Main Amps: 225
Bus Rating:	225
Bus Matl:	CU
NEMA:	1
Mounting:	Surface
Panel Info:	FEEDS BASEMENT, 1ST & 2ND

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	0	Demand Amps:	0			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Breaker Trip	Breaker P	Load VA	Load Description	Ckt #
1		840	3	50	4#6, 1#10G, 1"C	2,756	0	0	4#6, 1#10G, 1"C	50	3	1,916		2
3	PANEL RP3	845	-			0	2,274	0			-	1,430	PANEL RP7	4
5		305	-			0	0	1,358			-	1,054		6
7	RECP - SW ECR & VEST 1 THRU 2	720	1	20	2#12, 1#12G, 3/4"C	1,080	0	0	2#12, 1#12G, 3/4"C	20	1	360	RECP - COUNTY PARKING 113	8
9	RECP - BASE FIRE PUMP ROOM	360	1	20	2#12, 1#12G, 3/4"C	0	360	0		20	1		SPARE	10
11	RECEP - STORAGE RM 114	720	1	20	2#12, 1#12G, 3/4"C	0	0	1,440	2#12, 1#12G, 3/4"C	20	1	720	RECP - JUDGE LOBBY EMC 1ST & 2ND	12
13	SPARE		1	20		360	0	0	2#12, 1#12G, 3/4"C	20	1	360	RECEPS - NE ELEV PIT	14
15	SPARE		1	20		0	180	0	2#12, 1#12G, 3/4"C	20	1	180	RECEP - SW ELEV. PIT	16
17	FLR BOX & RECP - SHERIFF 1ST FLR	1,080	1	20	2#12, 1#12G, 3/4"C	0	0	1,260	2#12, 1#12G, 3/4"C	20	1	180	RECP - FIRE PUMP RM 102	18
19	RECP - SHERIFF R&R 1ST FLR	540	1	20	2#12, 1#12G, 3/4"C	1,260	0	0	2#12, 1#12G, 3/4"C	20	1	720	RECP - SHERIFF 1ST FLR	20
21	CU-5/AC-2 - E.C.R RM 2ND FLR	1,352	2	20	3#12, 1#12G, 1"C	0	2,116	0	2#12, 1#12G, 3/4"C	20	1	764	EF-2, EF-7 & MODS & EBB - 1ST FLR	22
23		1,352	-			0	0	1,532	2#12, 1#12G, 3/4"C	20	1	180	RECP - MAIN ELEC RM 103	24
25	CU-1 - 1ST FLR	1,716	2	25	3#10, 1#10G, 1"C	1,896	0	0	2#12, 1#12G, 3/4"C	20	1	180	RECP - EMERG ELEC RM 113	26
27		1,716	-			0	1,914	0	3#12, 1#12G, 3/4"C	15	2	198	IDU 3-1, 3-2 & 3-3 - NE LOBBY & EMC 1ST	28
29	SPARE		1	20		0	0	198			-	198	THRU 2ND	30
31	EBB-1 - TOILET 105	750	1	20	2#12, 1#12G, 3/4"C	2,646	0	0	3#4, 1#10G, 1"C	60	2	1,896	PANEL ERPB (INVERTER PANEL)	32
33	SPARE		2	15		0	3,246	0			-	3,246		34
35			-			0	0	180	2#12, 1#12G, 3/4"C	20	1	180	RECP - COUNTY PARKING 113	36
37	SPARE		1	20		0	0	0		20	1		SPARE	38
39	IDU 1-1, 1-2, 1-3 & 1-4 - SW LOBBY &	125	2	15	3#10, 1#10G, 3/4"C	0	978	0	3#12, 1#12G, 3/4"C	15	2	853	IDU 2-1 & 2-2 - SHERRIF DEPT 1ST FLR	40
41	EMC BASEMENT THRU 2ND	125	-			0	0	978			-	853		42
43	SPARE		1	20		0	0	0		20	1		SPARE	44
45	SPARE		2	15		0	0	0		15	2		SPARE	46
47			-			0	0	0			-			48
49	SPARE		2	15		0	0	0		20	1		SPARE	50
51			-			0	3,026	0	3#8, 1#10G, 3/4"C	35	2	3,026	CU-2	52
53	SPARE		1	20		0	0	3,026			-	3,026		54
						9,998	14,094	9,972	VA					
									VA (Sub-Feed)					
						9,998	14,094	9,972	VA (Total)					
						83	117	83	Amperage					

Total Connected Load: 34,064 VA
Total Connected Amps: 95 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]RP1

Panel OSLP1

Panel:	OSLP1
Location:	1ST FLR
Fed From:	MSB
Voltage:	480Y/277V, 3P4W
Main Config:	Main Amps:
Bus Rating:	
Bus Matl:	
NEMA:	1
Mounting:	Surface
Panel Info:	FEEDS BASEMENT, 1ST & 2ND

	Main Bkr SCA
	Branch Bkr SCA
	Branch Bkr Series SCA
X	100% Neutral Bus
X	Equipment Ground Bus
	Isolated Ground Bus
	Sub-Feed Lugs
	Sub-Feed Breaker ___ Amps
	Service Entrance Rated

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0	1st & 2nd:		0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	0	Demand Amps:	0			

Ckt #	Load Description	Load VA	Breaker P	Breaker Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Breaker Trip	Breaker P	Load VA	Load Description	Ckt #
1		558	3	20	4#12, 1#12G, 3/4"C	850	0	0	4#12, 1#12G, 3/4"C	20	3	292		2
3	ESP-2 - NE ELEV. PIT	558	-			0	850	0			-	292	ESP-1 - SW ELEV PIT	4
5		558	-			0	0	850			-	292		6
7						7,550	0	0	4#6, 1#10G, 1"C	50	3	7,550		8
9						0	6,632	0			-	6,632	OSRP1	10
11						0	0	6,882			-	6,882		12
						8,400	7,482	7,732	VA					
									VA (Sub-Feed)					
						8,400	7,482	7,732	VA (Total)					
						30	27	28	Amperage					

Total Connected Load: 23,614 VA
Total Connected Amps: 28 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]OSLP1

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL PANEL AND LUMINARIE SCHEDULES

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00
Drawing No.	E-008

Panel LP3

Panel:	LP3		Main Bkr SCA
Location:	3TH FLR		Branch Bkr SCA
Fed From:	MSB		Branch Bkr Series SCA
Voltage:	480Y/277V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	60		Isolated Ground Bus
Bus Matl:	CU		Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 3RD, 4TH, 5TH & 6TH		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	1,731	1.25	2,164			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	8,979	1.00	8,979	2,993	0.25	748
Demand VA:	11,891	Demand Amps:	14			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	LIGHTING - 3RD FLR	577	1	20	2#12, 1#12G, 3/4"C	577	0	0			1			2
3	LIGHTING - 4TH FLR	577	1	20	2#12, 1#12G, 3/4"C	0	577	0		20	1		SPARE	4
5	LIGHTING - 5TH FLR	577	1	20	2#12, 1#12G, 3/4"C	0	0	577		20	1		SPARE	6
7	SPARE		1	20		998	0	0	4#12, 1#12G, 3/4"C	15	3	998		8
9	SPARE		1	20		0	998	0			-	998	UH-8 - 4TH FLR	10
11	SPARE		1	20		0	0	998			-	998		12
13		998	3	15	4#12, 1#12G, 3/4"C	998	0	0			1			14
15	UH-7 - 3RD FLR	998	-			0	998	0			1			16
17		998	-			0	0	998			1			18
19		998	3	15	4#12, 1#12G, 3/4"C	998	0	0		15	3			20
21	UH-9 - 5TH FLR	998	-			0	998	0			-		SPARE	22
23		998	-			0	0	998			-			24

	Phase A	Phase B	Phase C	
	3,570	3,570	3,570	VA
				VA (Sub-Feed)
	3,570	3,570	3,570	VA (Total)
	13	13	13	Amperage

Total Connected Load: 10,710 VA
Total Connected Amps: 13 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]LP3

Panel ERP3

Panel:	ERP3		Main Bkr SCA
Location:	3RD FLR		Branch Bkr SCA
Fed From:	RP4		Branch Bkr Series SCA
Voltage:	208Y/120V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:			Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 3RD, 4TH, 5TH & 6TH		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	1,200	1.25	1,500	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	1,500	Demand Amps:	4			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	SW CODE BLUE - 3RD FLR	200	1	20	2#12, 1#12G, 3/4"C	400	0	0	2#12, 1#12G, 3/4"C	20	1	200	SW CODE BLUE - 5TH FLR	2
3	NE CODE BLUE - 3RD FLR	200	1	20	2#12, 1#12G, 3/4"C	0	400	0	2#12, 1#12G, 3/4"C	20	1	200	NE CODE BLUE - 5TH FLR	4
5	SW CODE BLUE - 4TH FLR	200	1	20	2#12, 1#12G, 3/4"C	0	0	200			1		SPARE	6
7	NE CODE BLUE - 4TH FLR	200	1	20	2#12, 1#12G, 3/4"C	200	0	0			1		SPARE	8
9	SPARE		1			0	0	0			1		SPARE	10
11	SPARE		1			0	0	0			1		SPARE	12

	Phase A	Phase B	Phase C	
	600	400	200	VA
				VA (Sub-Feed)
	600	400	200	VA (Total)
	5	3	2	Amperage

Total Connected Load: 1,200 VA
Total Connected Amps: 3 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ERP3

Panel RP7

Panel:	RP7		Main Bkr SCA
Location:	7TH FLR		Branch Bkr SCA
Fed From:	RP1		Branch Bkr Series SCA
Voltage:	208Y/120V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:	CU		Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 7TH, 8TH, 9TH & ROOF		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	1,620	1.00	1,620	0	0.50	0
General:	0	1.25	0	1,000	1.00	1,000
Motors:	1,592	1.00	1,592	796	0.25	199
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	187	1.00	187	187	0.25	47
Demand VA:	4,645	Demand Amps:	13			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	RECP - SW ELEC 6TH THRU 7TH	540	1	20	2#12, 1#12G, 3/4"C	1,336	0	0	2#12, 1#12G, 3/4"C	20	1	796	EF-4 & MODS - ROOF	2
3	RECP - NE LOBBY 7TH THRU 8TH	360	1	20	2#12, 1#12G, 3/4"C	0	1,156	0	2#12, 1#12G, 3/4"C	20	1	796	EF-5 & MODS - ROOF	4
5	RECP - NW ELEC RM	180	1	20	2#12, 1#12G, 3/4"C	0	0	180		20	1		SPARE	6
7	SPARE		1	20		0	0	0		20	1		SPARE	8
9	IDU 3-7, 3-8, 3-9 - NE LOBBY 6TH	94	2	15	3#12, 1#12G, 3/4"C	0	94	0		20	1		SPARE	10
11	THRU 8TH	94	-			0	0	94		20	1		SPARE	12
13	MOD'S - FLR 6-7	400	1	20	2#12, 1#12G, 3/4"C	400	0	0		20	1		SPARE	14
15	SPARE		1	20		0	0	0		20	1		SPARE	16
17	ROOF LIGHT & RECP	600	1	20	2#12, 1#12G, 3/4"C	0	0	600		20	1		SPARE	18
19	RECEP - NE ELEV. T.O.S.	180	1	20	2#12, 1#12G, 3/4"C	180	0	0		20	1		SPARE	20
21	RECEP - SE ELEV. T.O.S.	180	1	20	2#12, 1#12G, 3/4"C	0	180	0		20	1		SPARE	22
23	RECEP - NE ELEV. T.O.S.	180	1	20	2#12, 1#12G, 3/4"C	0	0	180		20	1		SPARE	24

	Phase A	Phase B	Phase C	
	1,916	1,430	1,054	VA
				VA (Sub-Feed)
	1,916	1,430	1,054	VA (Total)
	16	12	9	Amperage

Total Connected Load: 4,399 VA
Total Connected Amps: 12 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]RP7

Panel ELP7

Panel:	ELP7		Main Bkr SCA
Location:	7TH FLR		Branch Bkr SCA
Fed From:	ELP1		Branch Bkr Series SCA
Voltage:	480Y/277V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:			Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 7TH, 8TH & ROOF		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	2,478	1.25	3,098			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	3,098	Demand Amps:	4			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	EM LIGHTING - 7TH FLR	792	1	20	2#12, 1#12G, 3/4"C	792	0	0		20	1		SPARE	2
3	EM LIGHTING - 8TH FLR	792	1	20	2#12, 1#12G, 3/4"C	0	792	0		20	1		SPARE	4
5	EM LIGHTING - 6TH FLR	694	1	20	2#12, 1#12G, 3/4"C	0	0	694		20	1		SPARE	6
7	EM LIGHTING - ELEV. T.O.S.	200	1	20	2#12, 1#12G, 3/4"C	200	0	0		20	1		SPARE	8
9	SPARE		1	20		0	0	0		20	1		SPARE	10
11	SPARE		1	20		0	0	0		20	1		SPARE	12

	Phase A	Phase B	Phase C	
	992	792	694	VA
				VA (Sub-Feed)
	992	792	694	VA (Total)
	4	3	3	Amperage

Total Connected Load: 2,478 VA
Total Connected Amps: 3 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ELP7

Panel ERP7

Panel:	ERP7		Main Bkr SCA
Location:	7TH FLR		Branch Bkr SCA
Fed From:	ERP1		Branch Bkr Series SCA
Voltage:	208Y/120V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:			Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 7TH, 8TH & ROOF		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	0	1.00	0	0	0.50	0
General:	1,000	1.25	1,250	192	1.00	192
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	1,442	Demand Amps:	4			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	SW CODE BLUE - 7TH FLR	200	1	20	2#12, 1#12G, 3/4"C	296	0	0	2#12, 1#12G, 3/4"C	20	1	96	GENERATOR BATTERY CHARGER	2
3	NE CODE BLUE - 7TH FLR	200	1	20	2#12, 1#12G, 3/4"C	0	296	0	2#12, 1#12G, 3/4"C	20	1	96	GENERATOR BLOCK HEATER	4
5	SW CODE BLUE - 6TH FLR	200	1	20	2#12, 1#12G, 3/4"C	0	0	400	2#12, 1#12G, 3/4"C	20	1	200	NE CODE BLUE - 6TH FLR	6
7	NE CODE BLUE - 8TH FLR	200	1	20	2#12, 1#12G, 3/4"C	200	0	0			1		SPARE	8
9	SPARE		1			0	0	0			1		SPARE	10
11	SPARE		1			0	0	0			1		SPARE	12

	Phase A	Phase B	Phase C	
	496	296	400	VA
				VA (Sub-Feed)
	496	296	400	VA (Total)
	4	2	3	Amperage

Total Connected Load: 1,192 VA
Total Connected Amps: 3 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ERP7

Panel OSRP1

Panel:	OSRP1		Main Bkr SCA
Location:	1ST FLR		Branch Bkr SCA
Fed From:	OSLP1		Branch Bkr Series SCA
Voltage:	208Y/120V, 3P4W	X	100% Neutral Bus
Main Config:	MCB / Main Amps: 100	X	Equipment Ground Bus
Bus Rating:	100		Isolated Ground Bus
Bus Matl:			Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS BASEMENT, 1ST & 2ND		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	3,060	1.00	3,060	0	0.50	0
General:	11,800	1.25	14,750	500	1.00	500
Motors:	3,000	1.00	3,000	500	0.25	125
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	2,704	1.00	2,704	2,704	0.25	676
Demand VA:	24,815	Demand Amps:	69			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	IT RACK#1 - IT ROOM 1ST FLR	2,450	2	30	3#10, 1#10G, 3/4"C	2,950	0	0	2#12, 1#12G, 3/4"C	20	1	500	WEST ROLL-DOWN GATE 1ST FLR	2
3		2,450	-			0	3,450	0	2#10, 1#10G, 3/4"C	20	1	1,000	RECP #1 - IT ROOM 1ST FLR	4
5	IT RACK#2 - IT ROOM 1ST FLR	2,450	2	30	3#10, 1#10G, 3/4"C	0	0	3,450	2#10, 1#10G, 3/4"C	20	1	1,000	RECP #2 - IT ROOM 1ST FLR	6
7		2,450	-			2,700	0	0	2#12, 1#12G, 3/4"C	20	1	250	WEST IN GATE #1 - 1ST FLR	8
9	RECP - SHERIFF DESK#1 1ST FLR	1,080	1	20	2#10, 1#10G, 3/4"C	0	1,330	0	2#12, 1#12G, 3/4"C	20	1	250	WEST IN GATE #2 - 1ST FLR	10
11	RECP - SHERIFF DESK#2 1ST FLR	1,080	1	20	2#10, 1#10G, 3/4"C	0	0	1,330	2#12, 1#12G, 3/4"C	20	1	250	WEST OUT GATE #1 - 1ST FLR	12
13	RECP - SHERIFF DESK#3 1ST FLR	900	1	20	2#10, 1#10G, 3/4"C	1,150	0	0	2#12, 1#12G, 3/4"C	20	1	250	WEST OUT GATE #2 - 1ST FLR	14
15	SOUTH IN GATE - 1ST FLR	250	1	20	2#12, 1#12G, 3/4"C	0	250	0		20	1		SPARE	16
17	SOUTH OUT GATE - 1ST FLR	250	1	20	2#12, 1#12G, 3/4"C	0	0	750	2#12, 1#12G, 3/4"C	20	1	500	SOUTH ROLL-DOWN GATE 1ST FLR	18
19	WEST IN GATE - 8TH FLR	250	1	20	2#12, 1#12G, 3/4"C	250	0	0		20	1		SPARE	20
21	WEST OUT GATE - 8TH FLOOR	250	1	20	2#12, 1#12G, 3/4"C	0	250	0		20	1		SPARE	22
23	SPARE		1	20		0	0	0		20	1		SPARE	24
25	VEHICLE SENSE LOOP - 1ST FLR	500	1	20	2#12, 1#12G, 3/4"C	500	0	0		20	1		SPARE	26
27	CU-4/AC-1 - 1ST FLR	1,352	2	20	3#10, 1#10G, 3/4"C	0	1,352	0		20	1		SPARE	28
29		1,352	-			0	0	1,352		20	1		SPARE	30
31	SPARE		1	20		0	0	0		20	1		SPARE	32
33	SPARE		1	20		0	0	0		20	1		SPARE	34
35	SPARE		1	20		0	0	0		20	1		SPARE	36
37	SPARE		1	20		0	0	0		20	1		SPARE	38
39	SPARE		1	20		0	0	0		20	1		SPARE	40
41	SPARE		1	20		0	0	0		20	1		SPARE	42

	Phase A	Phase B	Phase C	
	7,550	6,632	6,882	VA
				VA (Sub-Feed)
	7,550	6,632	6,882	VA (Total)
	63	55	57	Amperage

Total Connected Load: 21,064 VA
Total Connected Amps: 58 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]OSRP1

Panel RP3

Panel:	RP3		Main Bkr SCA
Location:	3RD FLR		Branch Bkr SCA
Fed From:	RP1		Branch Bkr Series SCA
Voltage:	208Y/120V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:	CU		Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 3RD, 4TH, 5TH & 6TH		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	0	1.25	0			
Receptacles:	1,440	1.00	1,440	0	0.50	0
General:	0	1.25	0	300	1.00	300
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	250	1.00	250	250	0.25	62
Demand VA:	2,052	Demand Amps:	6			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	RECP - SW ELEC 3RD THRU 5TH	540	1	20	2#10, 1#10G, 3/4"C	540	0	0		20	1		SPARE	2
3	RECP - NE LOBBY 3RD THRU 6TH	720	1	20	2#10, 1#10G, 3/4"C	0	720	0		20	1		SPARE	4
5	RECP - NW ELEC RM	180	1	20	2#10, 1#10G, 3/4"C	0	0	180		20	2		SPARE	6
7	SPARE		1	20		0	0	0			-			8
9	IDU 3-4, 3-5 - NE LOBBY 3RD THRU	125	2	15	3#12, 1#12G, 3/4"C	0	125	0		20	1		SPARE	10
11	5TH	125	-			0	0	125		20	1		SPARE	12
13	MOD'S - FLR 3-5	300	1	20	2#12, 1#12G, 3/4"C	300	0	0		20	1		SPARE	14
15	SPARE		1	20		0	0	0		20	1		SPARE	16
17	SPARE		1	20		0	0	0		20	1		SPARE	18
19	SPARE		1	20		0	0	0		20	1		SPARE	20

	Phase A	Phase B	Phase C	
	840	845	305	VA
				VA (Sub-Feed)
	840	845	305	VA (Total)
	7	7	3	Amperage

Total Connected Load: 1,990 VA
Total Connected Amps: 6 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]RP3

Panel ELP3

Panel:	ELP3		Main Bkr SCA
Location:	3RD FLR		Branch Bkr SCA
Fed From:	ELP1		Branch Bkr Series SCA
Voltage:	480Y/277V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	50		Isolated Ground Bus
Bus Matl:			Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 3RD, 4TH, 5TH & 6TH		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	2,376	1.25	2,970			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	0	1.00	0	0	0.25	0
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	0	1.00	0	0	0.25	0
Demand VA:	2,970	Demand Amps:	4			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	EM LIGHTING - 3RD FLR	792	1	10	2#12, 1#12G, 3/4"C	792	0	0		20	1		SPARE	2
3	EM LIGHTING - 4TH FLR	792	1	10	2#12, 1#12G, 3/4"C	0	792	0		20	1		SPARE	4
5	EM LIGHTING - 5TH FLR	792	1	10	2#12, 1#12G, 3/4"C	0	0	792		20	1		SPARE	6
7	SPARE		1	10		0	0	0		20	1		SPARE	8
9	SPARE		1	10		0	0	0		20	1		SPARE	10

	Phase A	Phase B	Phase C	
	792	792	792	VA
				VA (Sub-Feed)
	792	792	792	VA (Total)
	3	3	3	Amperage

Total Connected Load: 2,376 VA
Total Connected Amps: 3 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]ELP3

Panel LP7

Panel:	LP7		Main Bkr SCA
Location:	7TH FLR		Branch Bkr SCA
Fed From:	MSB		Branch Bkr Series SCA
Voltage:	480Y/277V, 3P4W	X	100% Neutral Bus
Main Config:	MLO / Main Amps:	X	Equipment Ground Bus
Bus Rating:	100		Isolated Ground Bus
Bus Matl:	CU		Sub-Feed Lugs
NEMA:	1		Sub-Feed Breaker ___ Amps
Mounting:	Surface		Service Entrance Rated
Panel Info:	FEEDS 7TH, 8TH, 9TH & ROOF		

(Demand Calculation does not include sub-panel loads)

Category	Conn.	D.F.	Demand	Conn.	D.F.	Demand
Lighting:	1,731	1.25	2,164			
Receptacles:	0	1.00	0	0	0.50	0
General:	0	1.25	0	0	1.00	0
Motors:	3,823	1.00	3,823	1,911	0.25	478
Electric Space Htg:	0	1.00	0			0
Kitchen:	0	1.00	0		1st & 2nd:	0
Noncoincident:	0	0.00	0			0
HVAC:	23,445	1.00	23,445	17,459	0.25	4,365
Demand VA:	34,274	Demand Amps:	41			

Ckt #	Load Description	Load VA	P	Trip	Wiring	Phase A	Phase B	Phase C	Wiring	Trip	P	Load VA	Load Description	Ckt #
1	LIGHTING - 7TH FLR	577	1	20	3#12, 1#12G, 3/4"C	577	0	0		20	1		SPARE	2
3	LIGHTING - 8TH FLR	577	1	20	3#12, 1#12G, 3/4"C	0	577	0		20	1		SPARE	4
5	LIGHTING - 6TH FLR	577	1	20	3#12, 1#12G, 3/4"C	0	0	577		20	1		SPARE	6
7				15		5,820	0	0	4#10, 1#10G, 3/4"C	25	3	5,820		8
9	SPARE					0	5,820	0			-	5,820	CU-3 - ROOF	10
11						0	0	5,820			-	5,820		12
13		998	3	15	4#12, 1#12G, 3/4"C	1,995	0	0	4#12, 1#12G, 3/4"C	15	3	998		14
15	UH-11 - 7TH FLR	998	-			0	1,995	0			-	998	UH-10 - 6TH FLR	16
17		998	-			0	0	1,995			-	998		18
19			3	15		1,911	0	0	2#12, 1#12G, 3/4"C	20	1	1,911	EF-8	20
21	SPARE		-			0	1,911	0	2#12, 1#12G, 3/4"C	20	1	1,911	EF-9	22
23			-			0	0	0		20	1		SPARE	24
25			3	15		0	0	0		20	1		SPARE	26
27	SPARE		-			0	0	0		20	1		SPARE	28
29			-			0	0	0		20	1		SPARE	30

	Phase A	Phase B	Phase C	
	10,303	10,303	8,392	VA
				VA (Sub-Feed)
	10,303	10,303	8,392	VA (Total)
	37	37	30	Amperage

Total Connected Load: 28,999 VA
Total Connected Amps: 35 A
Notes:

\\VH-NASUNI\projects\2020\8C20305.00 - UNION COUNTY PARKING GARAGE\05 - Drawings\Electrical\Schedules\[8C20305 Panel Schedule, rev35 - USE THIS ONE.xlsm]LP7

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL PANEL SCHEDULES

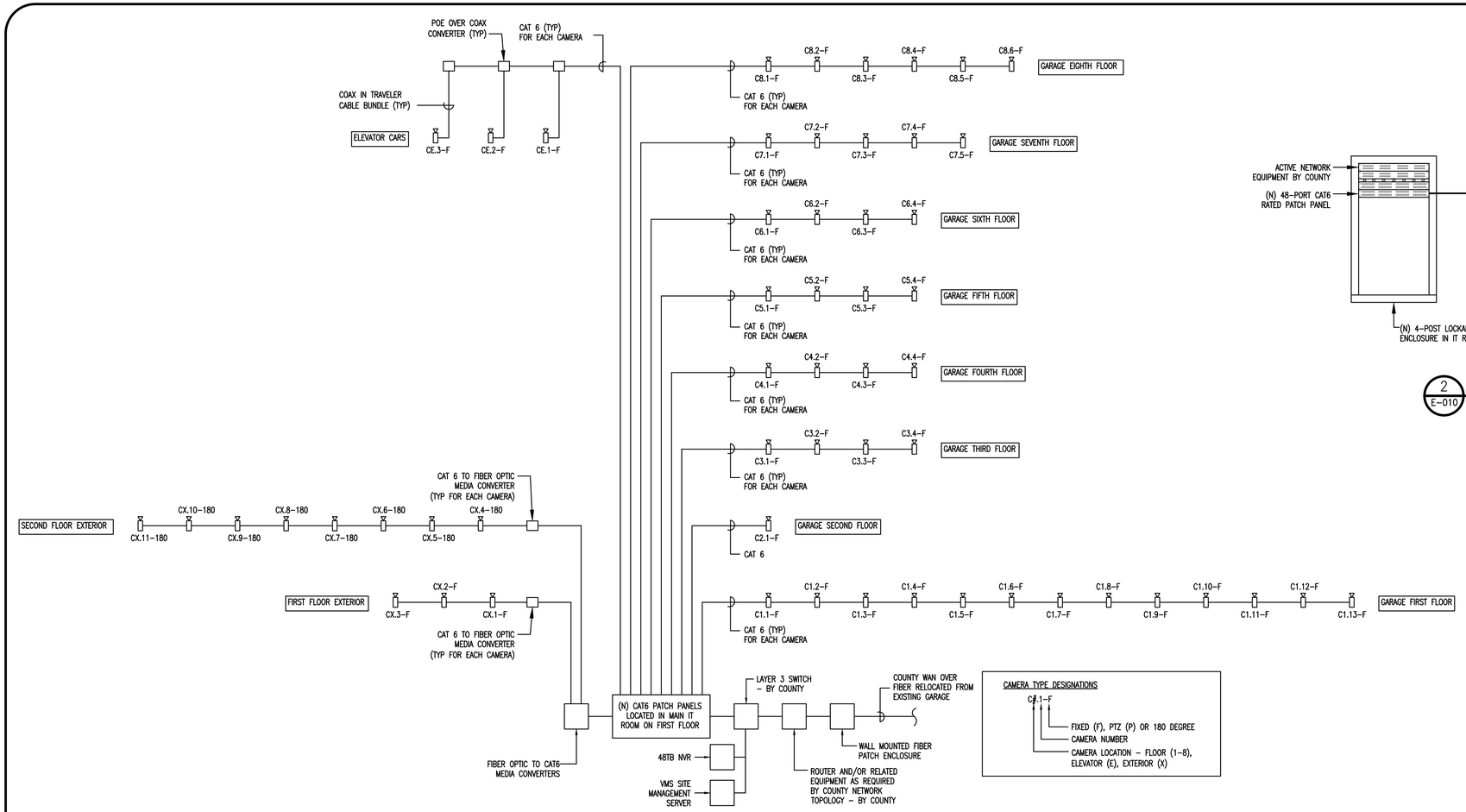
PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

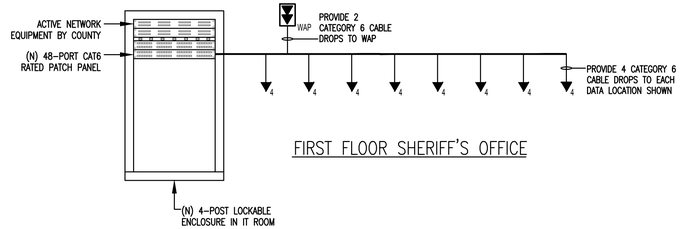
Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00
Drawing No.	E-009



1 VIDEO SURVEILLANCE SYSTEM DIAGRAM

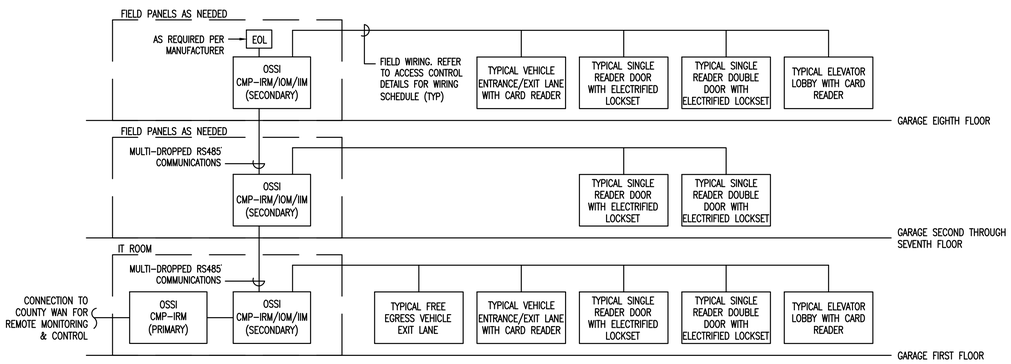
E-010 SCALE: NONE

NOTES:
1. ALL COMPONENTS, CABLING, EQUIPMENT, ETC. SHOWN SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR UNLESS NOTED OTHERWISE.



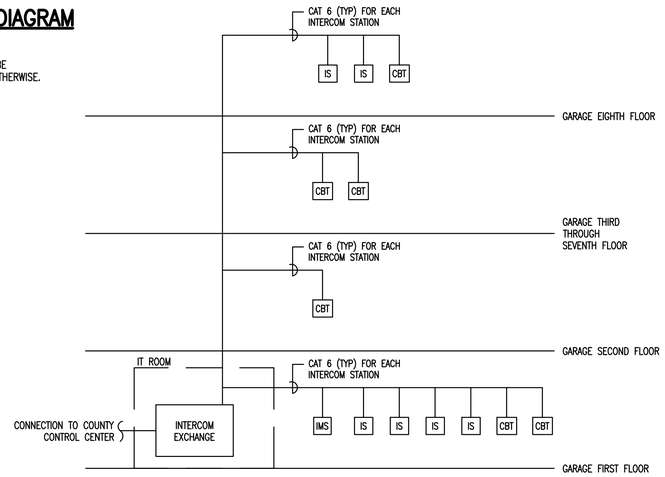
2 DATA NETWORK DIAGRAM

E-010 SCALE: NONE



3 ACCESS CONTROL DIAGRAM

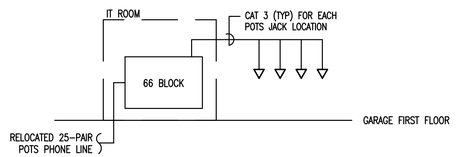
E-010 SCALE: NONE



4 INTERCOM/EMERGENCY PHONE DIAGRAM

E-010 SCALE: NONE

NOTES:
1. COORDINATE REMOTE MONITORING BY COUNTY VIA IP CONNECTION TO COUNTY WAN OR POTS DIALER AS DIRECTED BY COUNTY



6 POTS PHONE DIAGRAM

E-010 SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL LOW VOLTAGE DIAGRAMS

PROJECT TITLE:

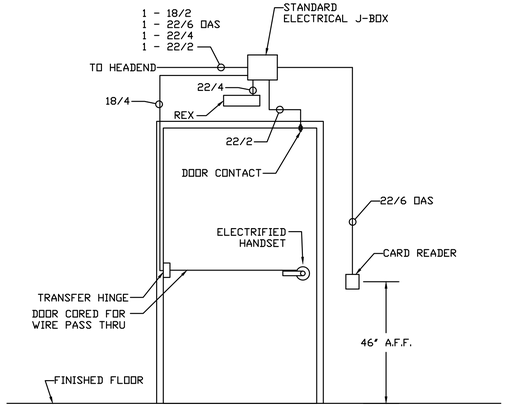
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

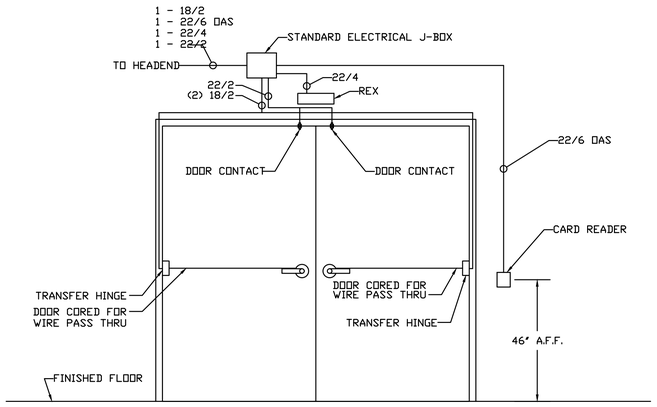
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-010



1A E-011 **SINGLE DOOR**
SCALE: NTS

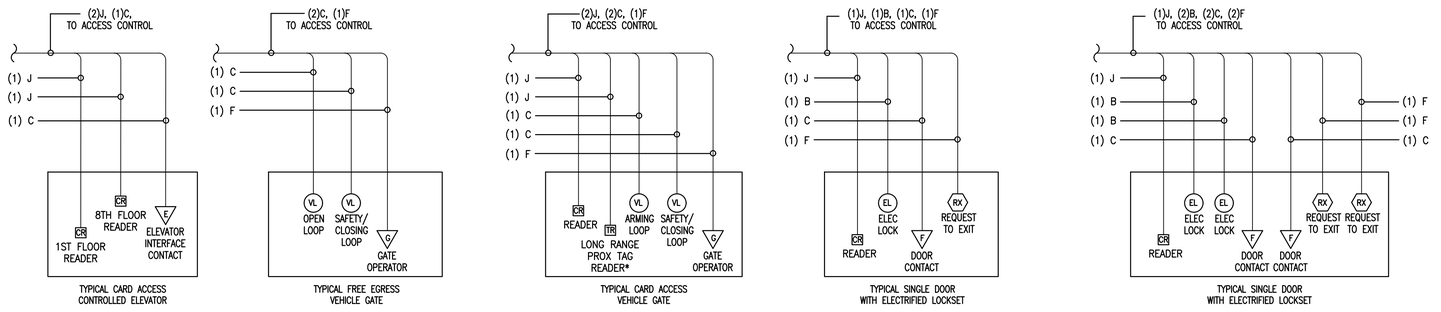


1B E-011 **DOUBLE DOOR**
SCALE: NTS

1 E-011 **DOOR DETAILS**
SCALE: NTS

CABLE LEGEND – PLENUM				
TYPE	DESCRIPTION/1000'	ANIXTER PART #	CABLE OD	COLOR CHART
A	SECURITY RG6U 18AWG COAX, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–RG6U–18–CMP	0.228"	N/A
B	SECURITY 18AWG, STR, 2COND, OAS, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–2CS18–CMP	0.163"	1
C	SECURITY 22AWG, STR, 1TSP, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–1TSP22–CMP	0.124"	3
D	SECURITY RG59U 20AWG COAX, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–RG59U–20–CMP	0.193"	N/A
E	SECURITY 20AWG, STR, 2COND, OAS, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–2CS20–CMP	0.145"	1
F	SECURITY 22AWG, STR, 2TSP, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–2TSP22–CMP	0.210"	3
G	SECURITY 16AWG, STR, 2COND, OAS, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–2CS16–CMP	0.190"	1
H	SECURITY 2–18/1–20AWG, STR, TSP, CMP JACKET COLOR – GREEN/WHITE STRIPE	S2PS18/1PS20CMP	0.310"	3
J	SECURITY 20AWG, STR, 6COND, OAS, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–6CS20–CMP	0.190"	1
K	SECURITY WESTINGHOUSE–RG6U 18AWG, COAX, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–W–RG6U–18–CMP	0.233"	N/A
L	SECURITY 24AWG, SOL, 4P, CAT5E, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–4P24CAT5E–CMP	0.200"	5
M	SECURITY 14AWG, STR, 2COND, OAS, CL3P JACKET COLOR – GREEN/WHITE STRIPE	S–2CS14–CL3P	0.229"	1
N	SECURITY 18AWG, STR, 2TSP, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–2TSP18–CMP	0.188"	3
P	SECURITY 22AWG, STR, 8COND, OAS, CMP JACKET COLOR – GREEN/WHITE STRIPE	S–8CS22–CMP	0.176"	1

CABLE LEGEND – NON–PLENUM				
TYPE	DESCRIPTION/1000'	ANIXTER PART #	CABLE OD	COLOR CHART
A	SECURITY RG6U 18AWG COAX, CM JACKET COLOR – GREEN	S–RG6U–18–CM	0.264"	N/A
B	SECURITY 18AWG, STR, 2COND, OAS, CMR JACKET COLOR – GREEN	S–2CS18–CMR	0.175"	1
C	SECURITY 22AWG, STR, 1TSP, CMR JACKET COLOR – GREEN	S–1TSP22–CMR	0.134"	3
D	SECURITY RG59U 20AWG COAX, CM JACKET COLOR – GREEN	S–RG59U–20–CM	0.228"	N/A
E	SECURITY 20AWG, STR, 2COND, OAS, CMR JACKET COLOR – GREEN	S–2CS20–CMR	0.153"	1
F	SECURITY 22AWG, STR, 2TSP, CMR JACKET COLOR – GREEN	S–2TSP22–CMR	0.209"	3
G	SECURITY 16AWG, STR, 2COND, OAS, CMR JACKET COLOR – GREEN	S–2CS16–CMR	0.200"	1
H	SECURITY 2–18/1–20AWG, STR, TSP, CMR JACKET COLOR – GREEN	S2PS18/1PS20CMR	0.320"	3
J	SECURITY 20AWG, STR, 6COND, OAS, CMR JACKET COLOR – GREEN	S–6CS20–CMR	0.205"	1
K	SECURITY WESTINGHOUSE–RG6U 18AWG, COAX, CM JACKET COLOR – GREEN	S–W–RG6U–18–CM	0.266"	N/A
L	SECURITY 24AWG, SOL, 4P, CAT5E, CM JACKET COLOR – GREEN	S–4P24CAT5E–CM	0.214"	5
M	SECURITY 14AWG, STR, 2COND, OAS, CL3R JACKET COLOR – GREEN	S–2CS14–CL3R	0.245"	1
N	SECURITY 18AWG, STR, 2TSP, CMR JACKET COLOR – GREEN	S–2TSP18–CMR	0.205"	3
P	SECURITY 22AWG, STR, 8COND, OAS, CMR JACKET COLOR – GREEN	S–8CS22–CMR	0.200"	1



2 E-011 **TYPICAL ACCESS CONTROL WIRING DIAGRAMS**
SCALE: NONE
NOTES:
1. TAG READER AT LOCATIONS AS INDICATED ON PLANS.
2. COORDINATE ELEVATOR INTERFACE WITH ELEVATOR VENDOR FOR EXPRESS OPERATION UPON VALID CARD READ..

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL ACCESS CONTROL DETAILS

PROJECT TITLE:

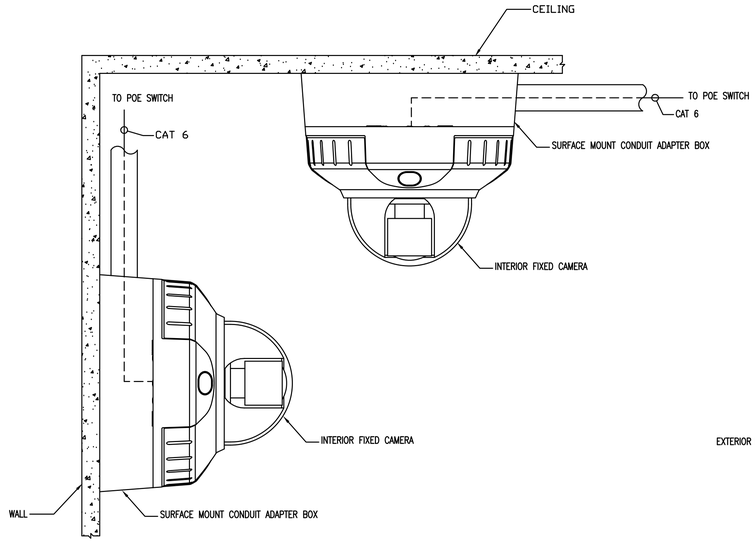
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

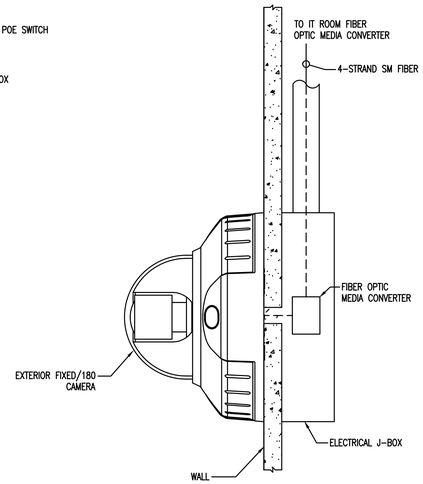
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

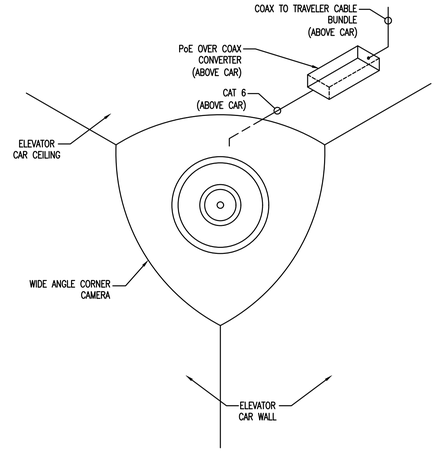
Drawing No.
E–011



INTERIOR FIXED TYPE CAMERA

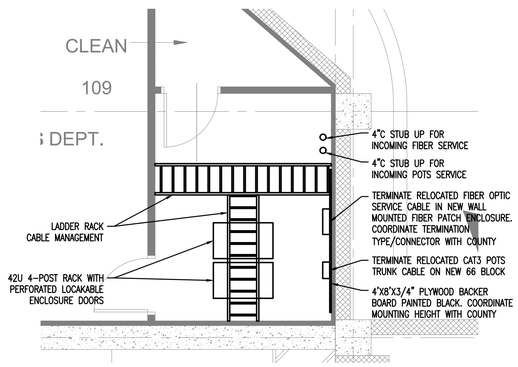


EXTERIOR FIXED/180 TYPE CAMERA



ELEVATOR FIXED TYPE CAMERA

1 E-012 **CAMERA DETAILS**
SCALE: NTS



2 E-012 **IT ROOM ENLARGED PLAN**
SCALE: NTS

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL CAMERA DETAILS & ENLARGED IT ROOM PLAN

PROJECT TITLE:

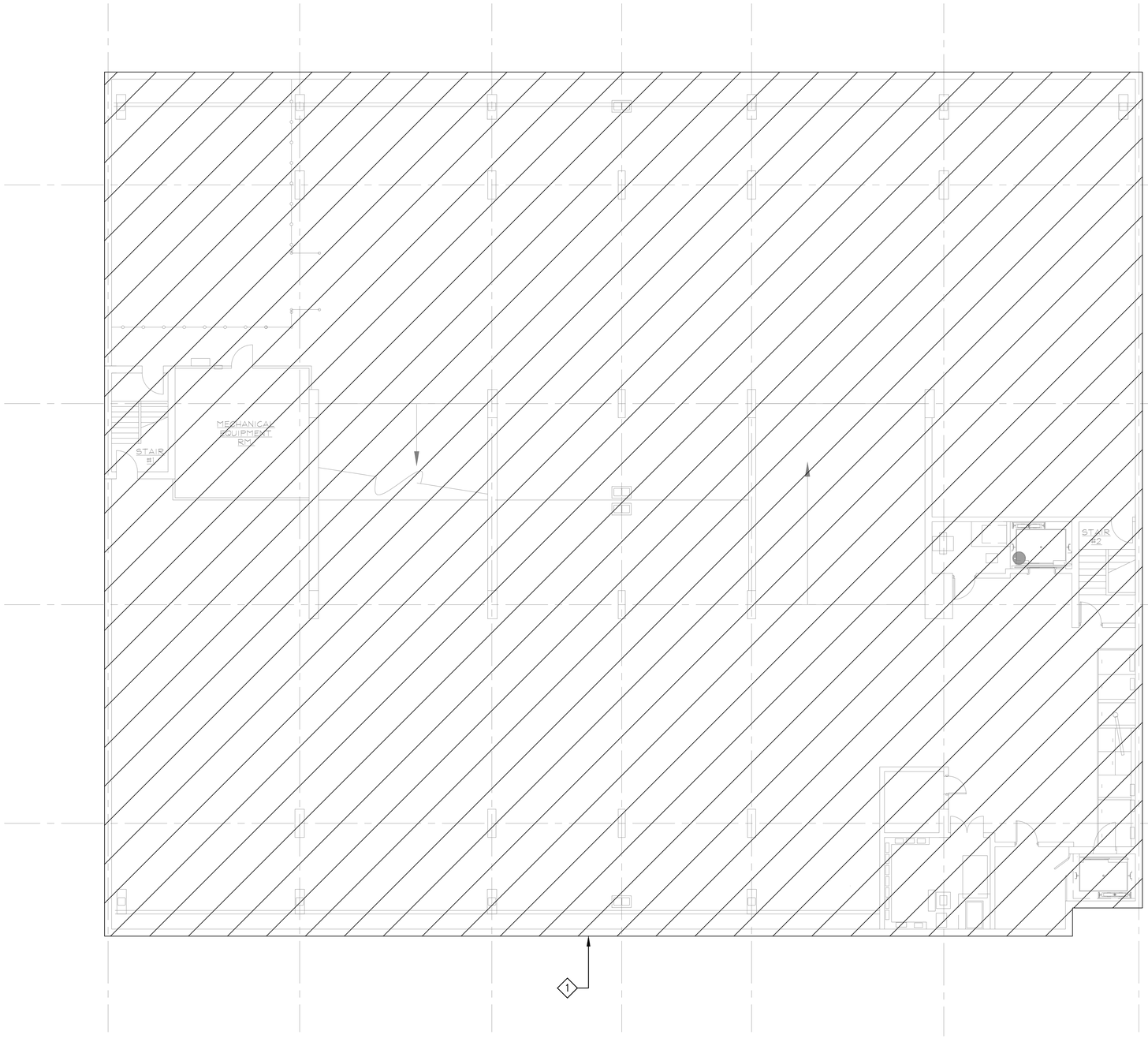
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-012



ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

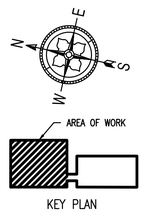
ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇ AND ARE NUMBERED AS FOLLOWS:

◇1 ELECTRICAL CONTRACTOR SHALL DEMOLISH/REMOVE ALL NECESSARY DEVICES INCLUDING LIGHTING, RECEPTACLES, BACKBOXES, DATA FIXTURES, WIRING, RACEWAY AND ASSOCIATED CONDUCTORS/CONDUIT, AS REQUIRED.

1 / ED-100 ELECTRICAL – EXISTING GARAGE BASEMENT DEMOLITION PLAN
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN

PROJECT TITLE:

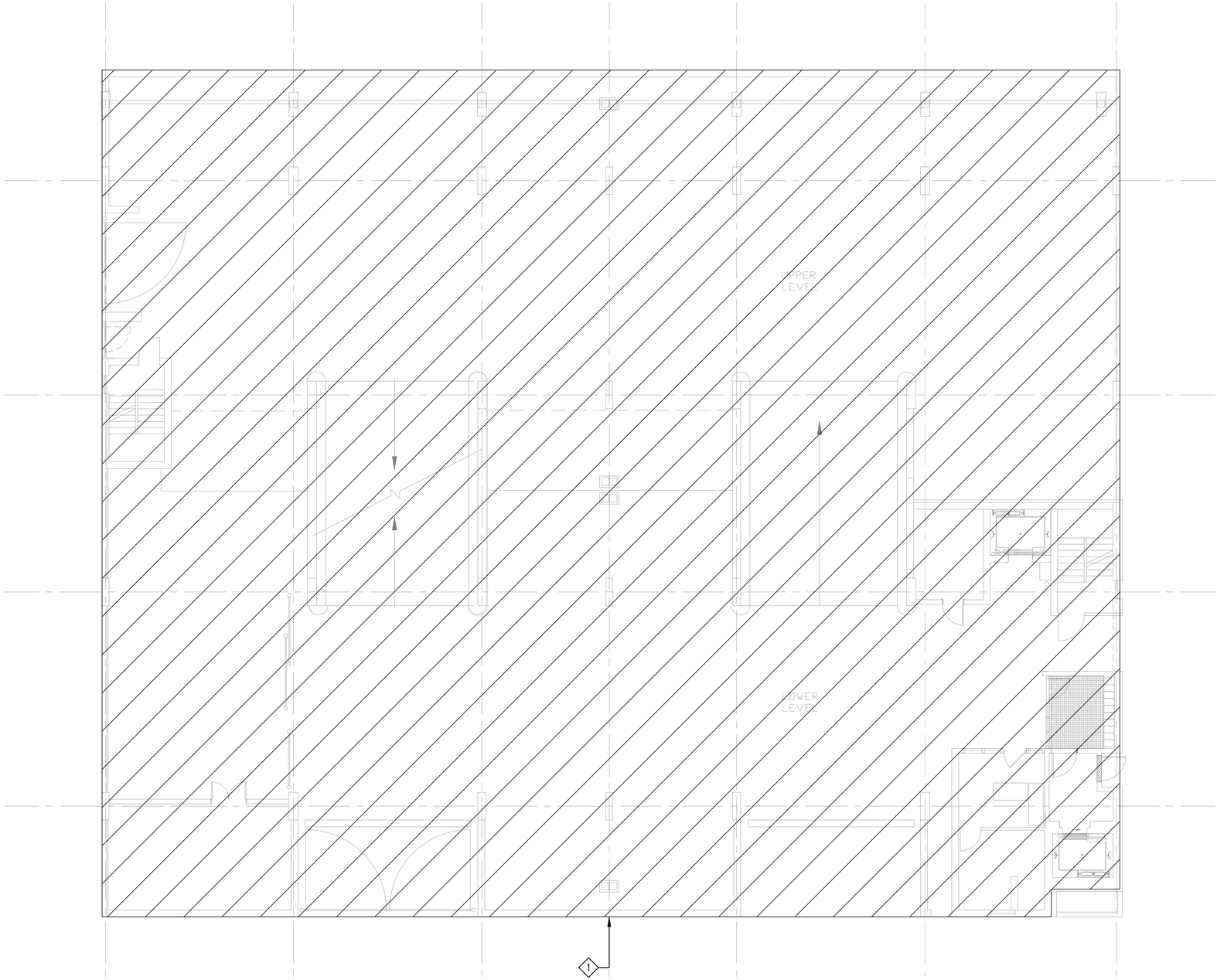
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
ED–100



ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

   A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

   B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

   C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

   D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

   E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

   F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

   G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

   H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

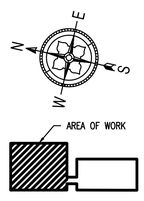
ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇ AND ARE NUMBERED AS FOLLOWS:

◇1 ELECTRICAL CONTRACTOR SHALL DEMOLISH/REMOVE ALL NECESSARY DEVICES INCLUDING LIGHTING, RECEPTACLES, BACKBOXES, DATA FIXTURES, WIRING, RACEWAY AND ASSOCIATED CONDUCTORS/CONDUIT, AS REQUIRED.

1 / ED-101 ELECTRICAL – EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN

PROJECT TITLE:

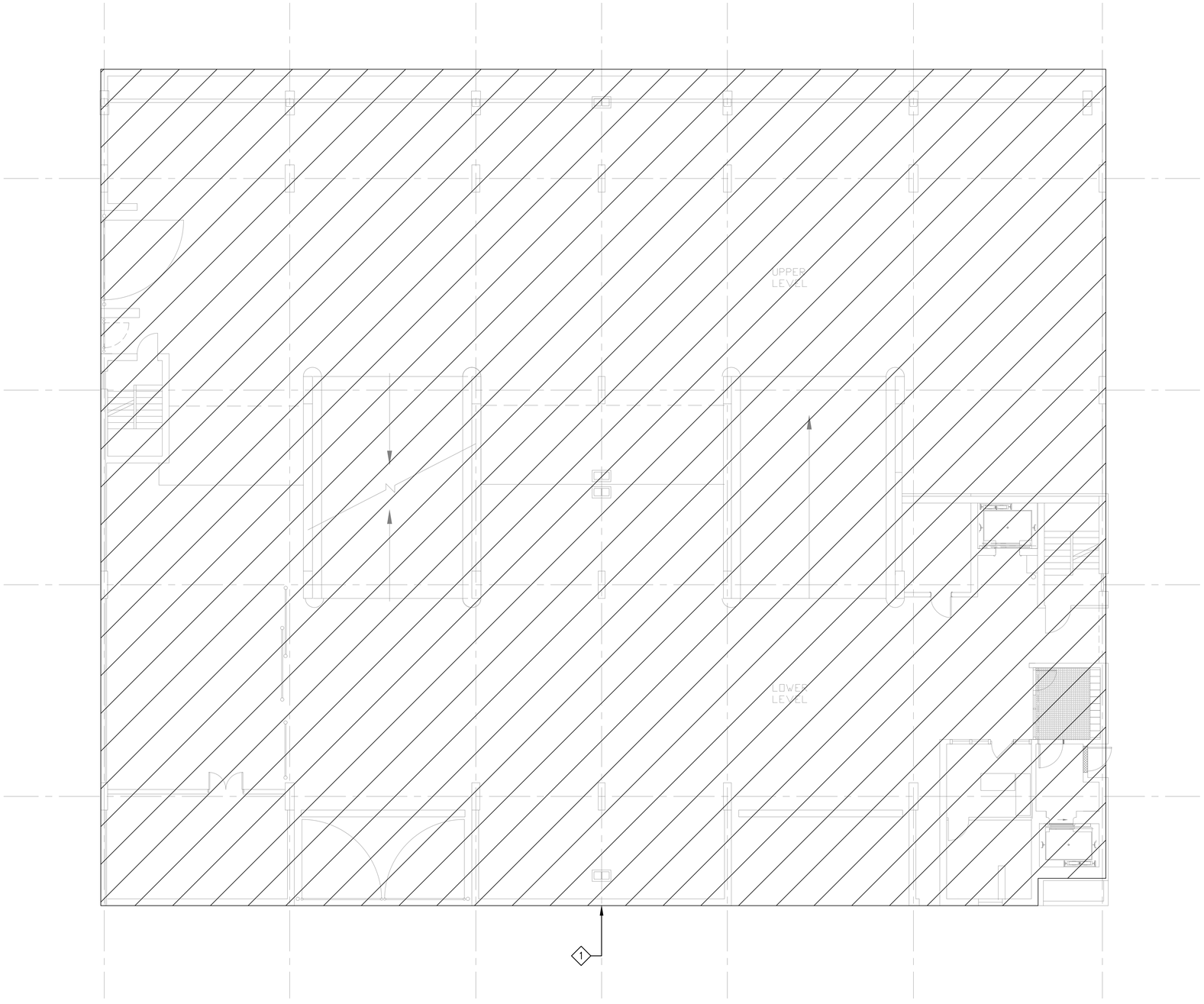
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
ED–101



1 ED-102 ELECTRICAL – SECOND TO SIXTH FLOOR DEMOLITION PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

   A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

   B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

   C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

   D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

   E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

   F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

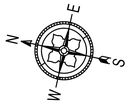
   G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

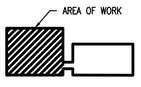
   H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇ AND ARE NUMBERED AS FOLLOWS:

◇1 ELECTRICAL CONTRACTOR SHALL DEMOLISH/REMOVE ALL NECESSARY DEVICES INCLUDING LIGHTING, RECEPTACLES, BACKBOXES, DATA FIXTURES, WIRING, RACEWAY AND ASSOCIATED CONDUCTORS/CONDUIT, AS REQUIRED.





KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE SECOND TO SIXTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

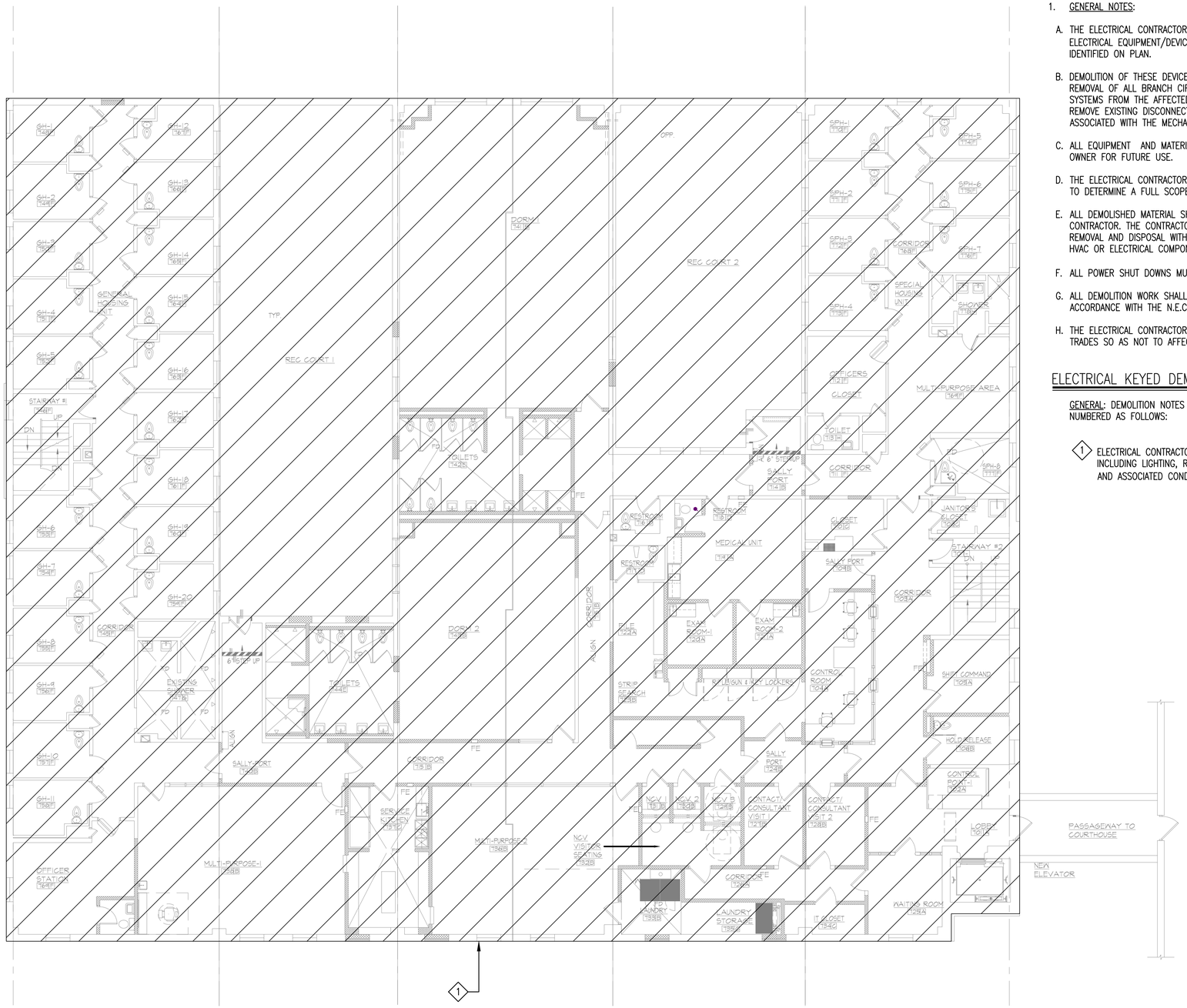
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

ED–102



ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

   A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

   B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

   C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

   D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

   E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

   F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

   G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

   H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

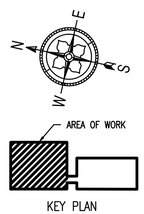
ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇ AND ARE NUMBERED AS FOLLOWS:

◇1 ELECTRICAL CONTRACTOR SHALL DEMOLISH/REMOVE ALL NECESSARY DEVICES INCLUDING LIGHTING, RECEPTACLES, BACKBOXES, DATA FIXTURES, WIRING, RACEWAY AND ASSOCIATED CONDUCTORS/CONDUIT, AS REQUIRED.

1 ED-103 **ELECTRICAL – EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

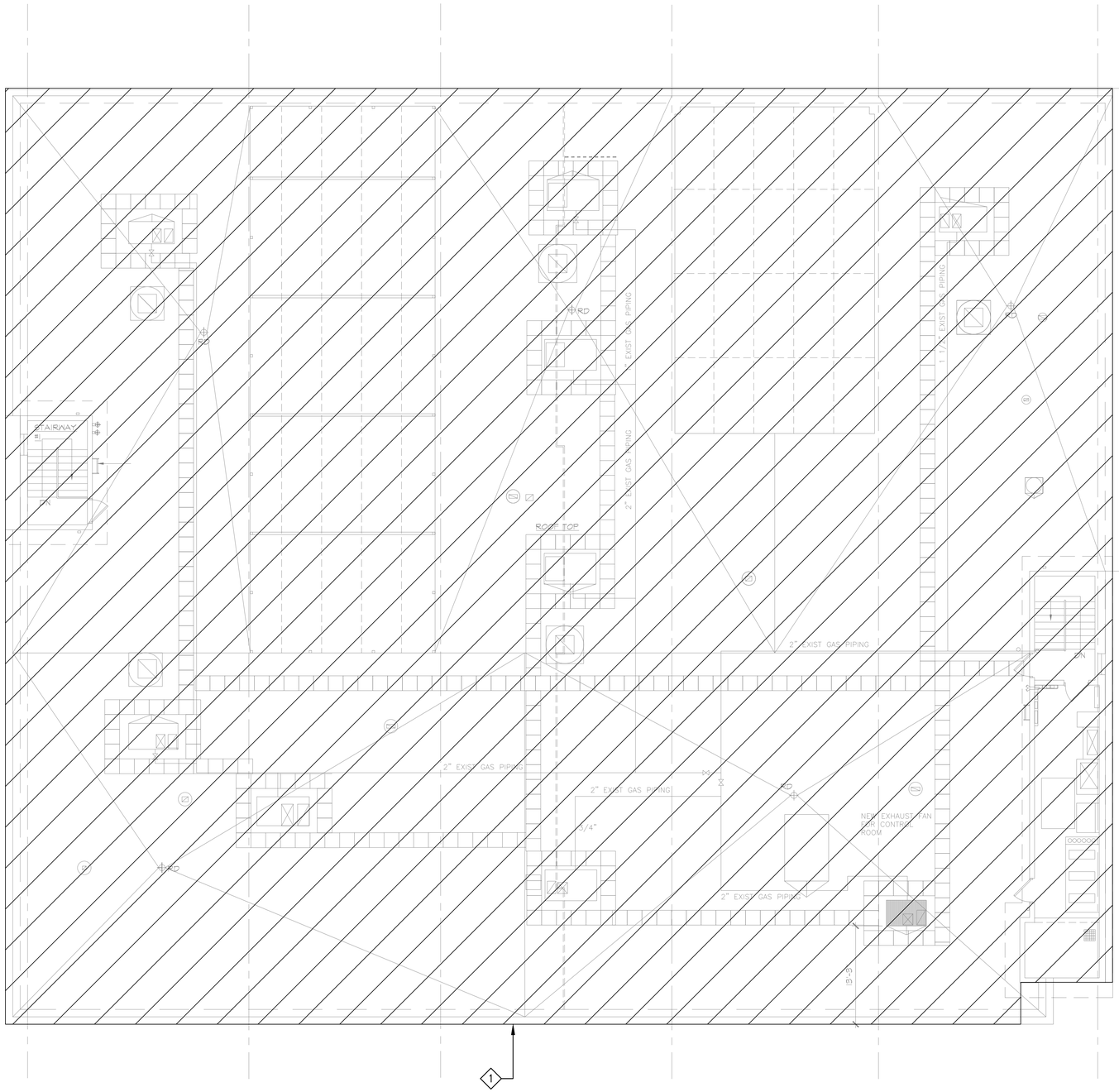
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
ED–103



ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

   A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

   B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

   C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

   D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

   E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

   F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

   G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

   H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

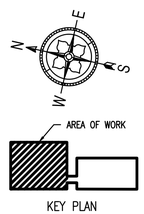
ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇ AND ARE NUMBERED AS FOLLOWS:

◇1 ELECTRICAL CONTRACTOR SHALL DEMOLISH/REMOVE ALL NECESSARY DEVICES INCLUDING LIGHTING, RECEPTACLES, BACKBOXES, DATA FIXTURES, WIRING, RACEWAY AND ASSOCIATED CONDUCTORS/CONDUIT, AS REQUIRED.

1 / ED-104 ELECTRICAL – EXISTING GARAGE ROOF DEMOLITION PLAN
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE ROOF DEMOLITION PLAN

PROJECT TITLE:

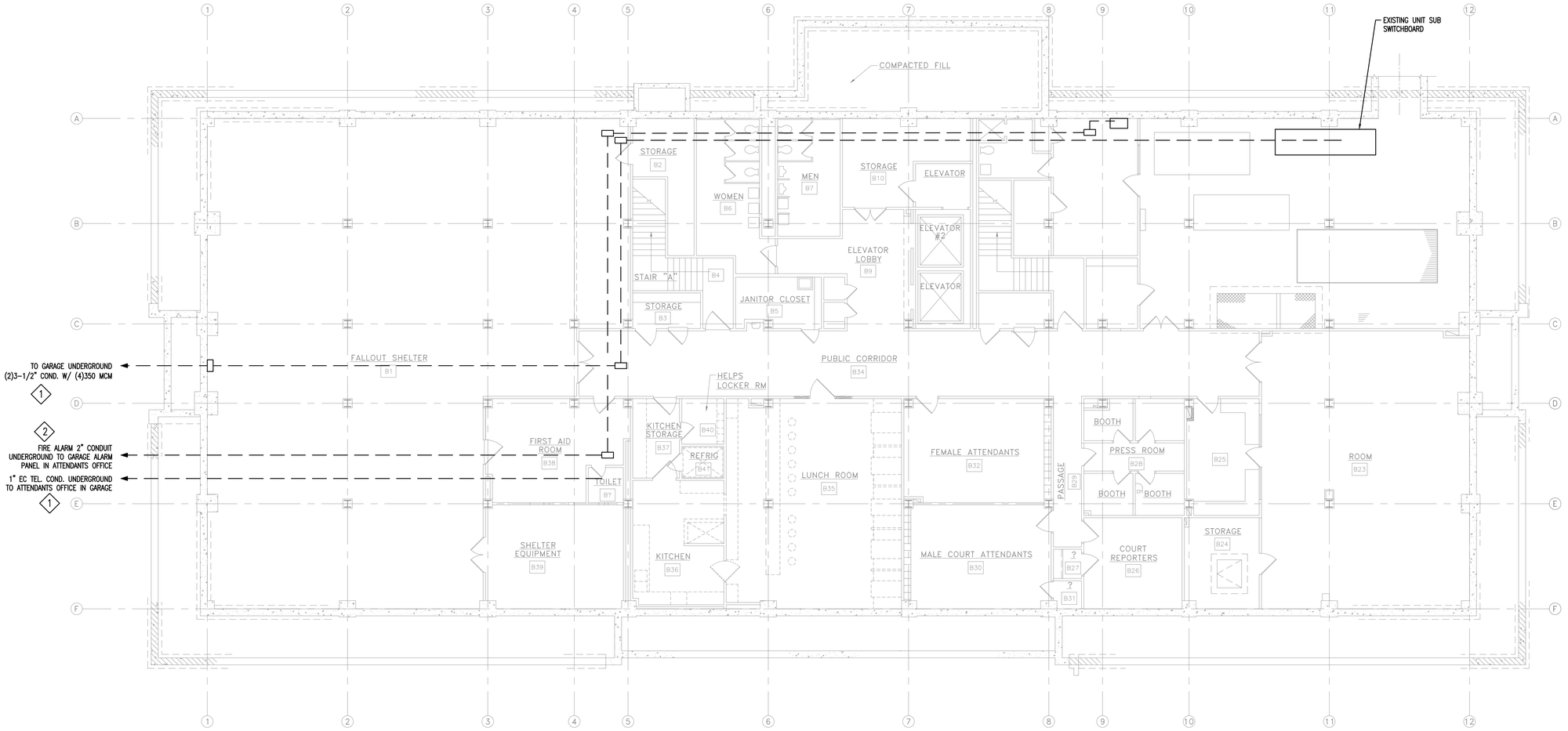
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
ED–104



1 ED-200 ELECTRICAL – EXISTING GARAGE BASEMENT DEMOLITION PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

ELECTRICAL GENERAL DEMOLITION NOTES

1. GENERAL NOTES:

   A. THE ELECTRICAL CONTRACTOR SHALL ACCOMPLISH COMPLETE ELECTRICAL DEMOLITION OF ALL ELECTRICAL EQUIPMENT/DEVICES ASSOCIATED WITH THE REMOVAL OF MECHANICAL EQUIPMENT IDENTIFIED ON PLAN.

   B. DEMOLITION OF THESE DEVICES SHALL INCLUDE, BUT NOT BE LIMITED TO, COMPLETE REMOVAL OF ALL BRANCH CIRCUIT POWER WIRING AND ASSOCIATED CONDUIT AND BOX SYSTEMS FROM THE AFFECTED MECHANICAL EQUIPMENT BACK TO THE PANEL OF ORIGIN. REMOVE EXISTING DISCONNECT SWITCHES, STARTERS AND OTHER ELECTRICAL EQUIPMENT ASSOCIATED WITH THE MECHANICAL EQUIPMENT AND SYSTEMS BEING DEMOLISHED.

   C. ALL EQUIPMENT AND MATERIALS TO BE DEMOLISHED SHALL BE TURNED OVER TO THE OWNER FOR FUTURE USE.

   D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION OF THE PROJECT AREA TO DETERMINE A FULL SCOPE OF DEMOLITION WORK BEFORE SUBMITTING A PROPOSAL.

   E. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE SITE BY THE ELECTRICAL CONTRACTOR. THE CONTRACTOR IS TO RECYCLE WHEREVER POSSIBLE. COORDINATE ALL REMOVAL AND DISPOSAL WITH THE OWNER WHO RESERVES THE RIGHT TO SALVAGE ANY HVAC OR ELECTRICAL COMPONENTS.

   F. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

   G. ALL DEMOLITION WORK SHALL BE DONE IN A SAFE AND ORDERLY MANNER AND IN ACCORDANCE WITH THE N.E.C., OSHA AND STATE REGULATIONS.

   H. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE REMOVAL OF EQUIPMENT WITH OTHER TRADES SO AS NOT TO AFFECT THE OPERATION OF EXISTING SYSTEMS.

ELECTRICAL KEYED DEMOLITION NOTES

GENERAL: DEMOLITION NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL ◇– AND ARE NUMBERED AS FOLLOWS:

◇1 DEMOLISH AND REMOVE EXISTING CONDUCTORS/CONDUIT AND JUNCTION BOXES BACK TO SOURCE TO ACCOMMODATE DEMOLITION OF EXISTING GARAGE.

◇2 DEMOLISH AND REMOVE EXISTING FIRE ALARM CONDUCTORS BACK TO SOURCE TO ACCOMMODATE DEMOLITION OF EXISTING GARAGE. MAINTAIN TO THE MAXIMUM EXTENT POSSIBLE CONDUIT AND JUNCTION BOXES FOR NEW WORK.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - EXISTING GARAGE BASEMENT DEMOLITION PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

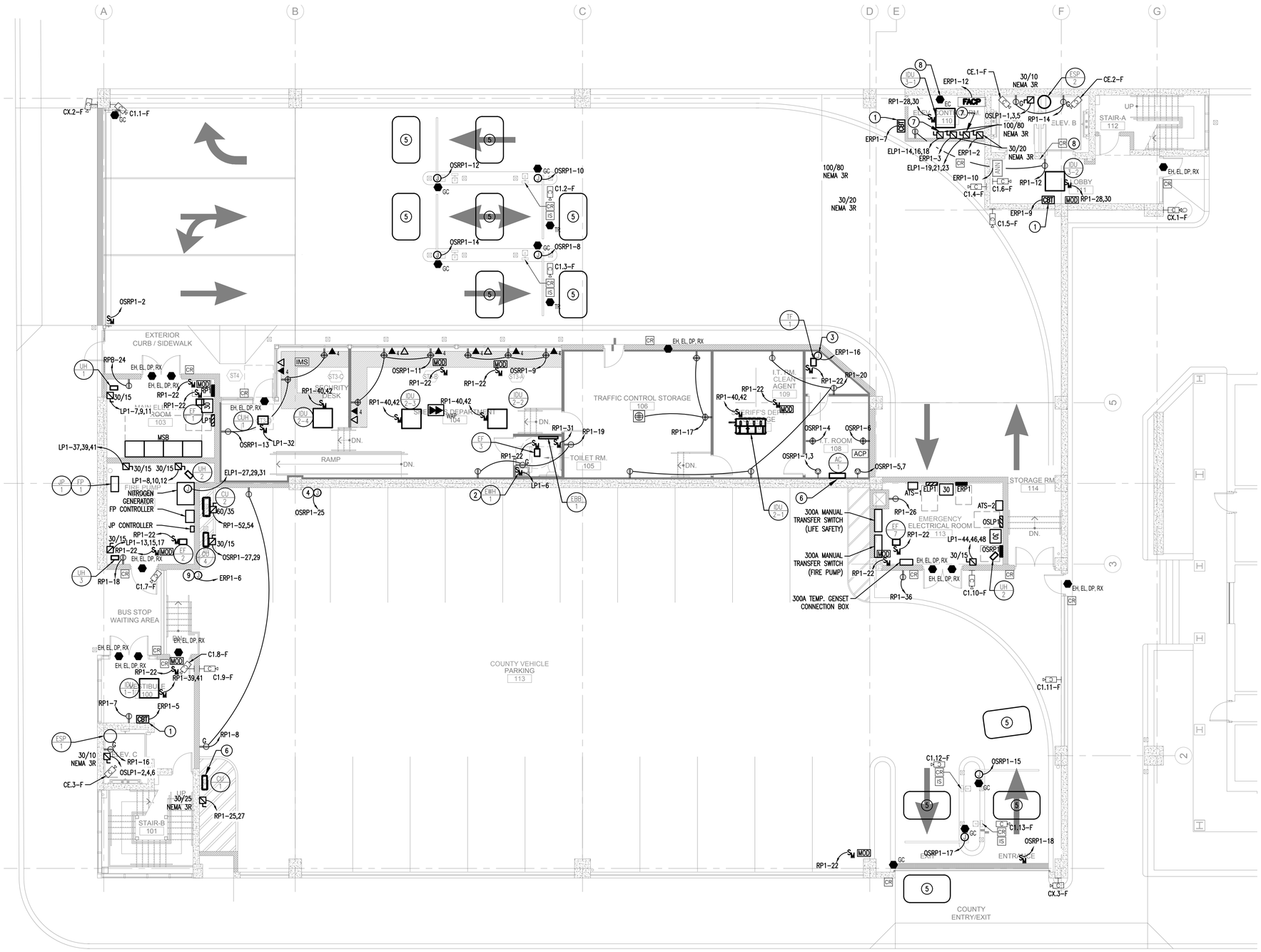
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

ED-200



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR 'NOTES' THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-010 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (n) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL CODE BLUE TELEPHONE STATION IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE AND INSTALL POWER AND DATA TO EACH CODE BLUE TELEPHONE STATION. COORDINATE FINAL EQUIPMENT SELECTIONS WITH THE OWNERS. PROVIDE REMOTE 'CODE BLUE TELEPHONE' SIGN PURCHASED FROM THE MANUFACTURER AND REMOTE CODE BLUE LIGHT TO BE MOUNTED IMMEDIATELY AROUND THE CORNER FROM THE CODE BLUE TELEPHONE MAIN UNIT. COORDINATE FINAL LOCATIONS WITH THE OWNER. BASIS OF DESIGN: MANUFACTURER: AIPHONE; WALL BOX CAT#: WE-HE; INTERNALS CAT#: IX-DVF-RA.

(2) PROVIDE POWER FOR NEW WATER HEATER. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL DETAILS.

(3) PROVIDE POWER FOR NEW FM200 SYSTEM. REFER TO FIRE PROTECTION DRAWINGS FOR ADDITIONAL DETAILS.

(4) ELECTRICAL CONTRACTOR SHALL COORDINATE FINAL LOCATION OF HEAT TRACE WITH PLUMBING DRAWINGS.

(5) PROVIDE UNDERGROUND CONDUIT IN THIS AREA FOR VEHICLE SENSE LOOP AS REQUIRED. COORDINATE FINAL STUB UP LOCATION WITH GATE MANUFACTURER.

(6) PROVIDE AND INSTALL ALL INTERCONNECTING WIRING IN CONDUIT FROM CU TO ASSOCIATED AC. PROVIDE LOCAL DISCONNECTING MEANS AS REQUIRED AND RECOMMENDED BY MANUFACTURER. COORDINATE ALL REQUIREMENTS WITH MANUFACTURER.

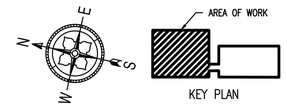
(7) ELEVATOR DISCONNECT SHALL MEET THE REQUIREMENTS OF NEC 620.51. DISCONNECT VOLTAGE AND CURRENT RATINGS FOR MAIN AND AUXILIARY CONTACT RATED FOR USE WITH 24VDC AT UP TO 2 AMPS. ALL ELEVATOR RELATED DISCONNECTS REQUIRE PERMANENTLY-MOUNTED LOCKING MECHANISMS AND SHALL BE CONSPICUOUSLY LABELED WITH ELEVATOR NUMBER, CIRCUITS BEING DISCONNECTED AND LOADS ASSOCIATED WITH THE CIRCUIT BEING DISCONNECTED. THIS INCLUDES MAIN ELEVATOR DISCONNECT, AUXILIARY ELEVATOR DISCONNECT, ELEVATOR LIGHTING CIRCUIT DISCONNECT AND BRANCH CIRCUIT BREAKERS THAT SERVE ANY AND ALL EQUIPMENT WITHIN THE ELEVATOR HOISTWAY.

(8) COORDINATE EXPRESS ELEVATOR FUNCTION FOR JUDGES ON AUTHORIZED CARD READ WITH ELEVATOR CONTROLS.

(9) ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL HEAT TRACING AND ASSOCIATED POWER SUPPLIES ON WET FIRE SPRINKLER MAIN IN EXPOSED CEILING AREAS. COORDINATE FINAL MOUNTING LOCATION AND REQUIREMENTS WITH FIRE PROTECTION CONTRACTOR. REFER TO DETAL 6/E-007 FOR ADDITIONAL INFORMATION.

1 / E-101 — ELECTRICAL – NEW GARAGE FIRST FLOOR PLAN – POWER
SCALE: 1/8"=1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

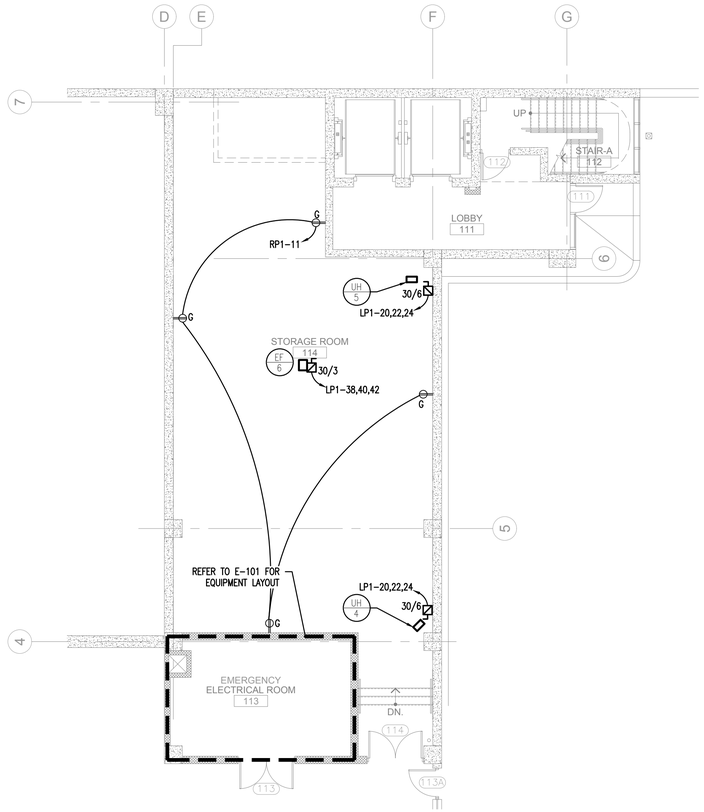
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E—101



1 E-101A **ELECTRICAL – NEW GARAGE PARTIAL FIRST FLOOR PLAN – POWER**

SCALE: 1/8" = 1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

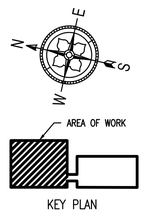
P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

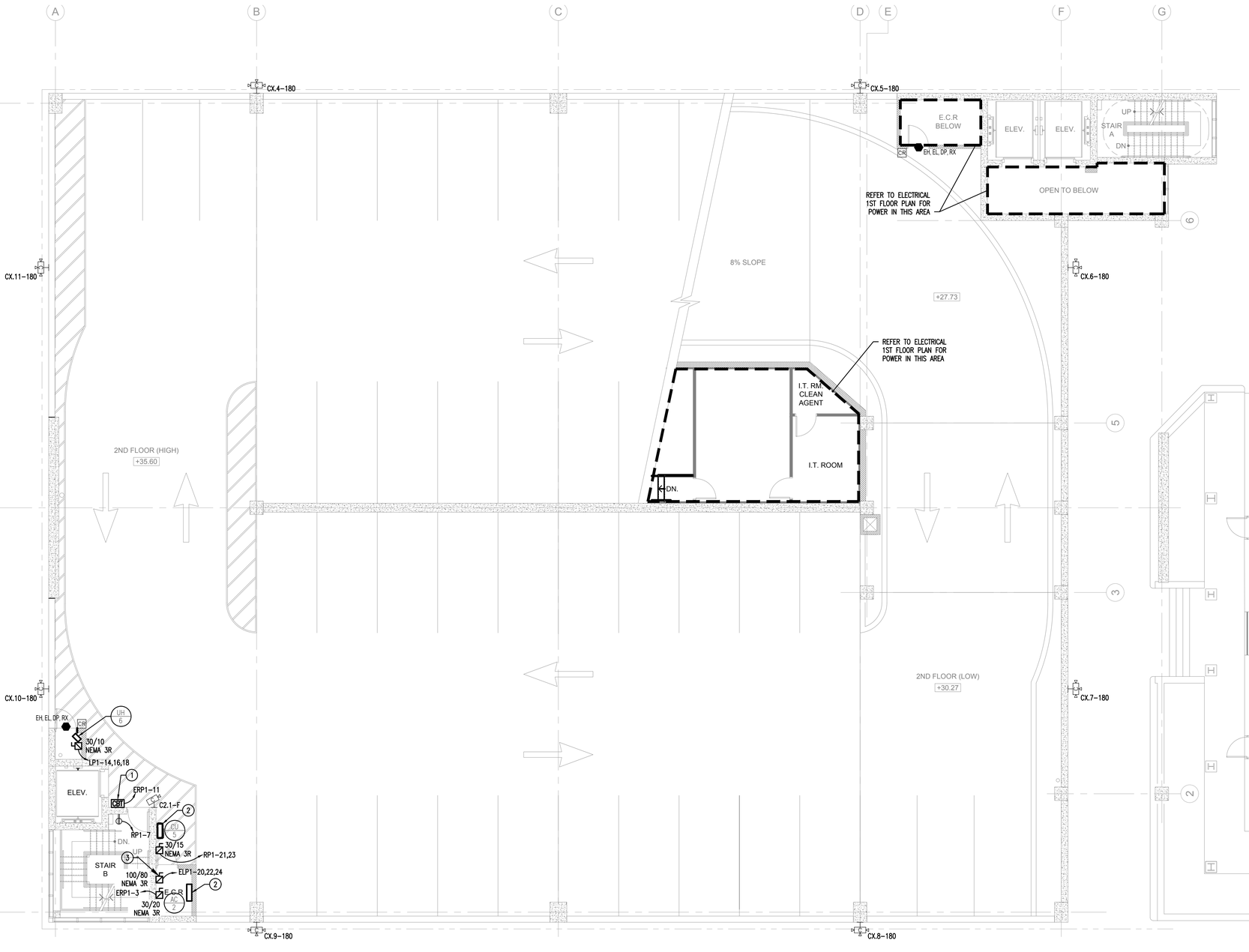
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-101A



ELIZABETHTOWN PLAZA

1 E-102 ELECTRICAL – NEW GARAGE SECOND FLOOR PLAN – POWER

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

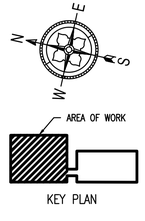
2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL CODE BLUE TELEPHONE STATION IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE AND INSTALL POWER AND DATA TO EACH CODE BLUE TELEPHONE STATION. COORDINATE FINAL EQUIPMENT SELECTIONS WITH THE OWNERS. PROVIDE REMOTE "CODE BLUE TELEPHONE" SIGN PURCHASED FROM THE MANUFACTURER AND REMOTE CODE BLUE LIGHT TO BE MOUNTED IMMEDIATELY AROUND THE CORNER FROM THE CODE BLUE TELEPHONE MAIN UNIT. COORDINATE FINAL LOCATIONS WITH THE OWNER. BASIS OF DESIGN: MANUFACTURER: AIPHONE; WALL BOX CAT#: WE-HE; INTERNALS CAT#: IX-DVF-RA.

(2) PROVIDE AND INSTALL ALL INTERCONNECTING WIRING IN CONDUIT FROM CU TO ASSOCIATED AC. PROVIDE LOCAL DISCONNECTING MEANS AS REQUIRED AND RECOMMENDED BY MANUFACTURER. COORDINATE ALL REQUIREMENTS WITH MANUFACTURER.

(3) ELEVATOR DISCONNECT SHALL MEET THE REQUIREMENTS OF NEC 620.51. DISCONNECT VOLTAGE AND CURRENT RATINGS FOR MAIN AND AUXILIARY CONTACT RATED FOR USE WITH 24VDC AT UP TO 2 AMPS. ALL ELEVATOR RELATED DISCONNECTS REQUIRE PERMANENTLY-MOUNTED LOCKING MECHANISMS AND SHALL BE CONSPICUOUSLY LABELED WITH ELEVATOR NUMBER, CIRCUITS BEING DISCONNECTED AND LOADS ASSOCIATED WITH THE CIRCUIT BEING DISCONNECTED. THIS INCLUDES MAIN ELEVATOR DISCONNECT, AUXILIARY ELEVATOR DISCONNECT, ELEVATOR LIGHTING CIRCUIT DISCONNECT AND BRANCH CIRCUIT BREAKERS THAT SERVE ANY AND ALL EQUIPMENT WITHIN THE ELEVATOR HOISTWAY.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

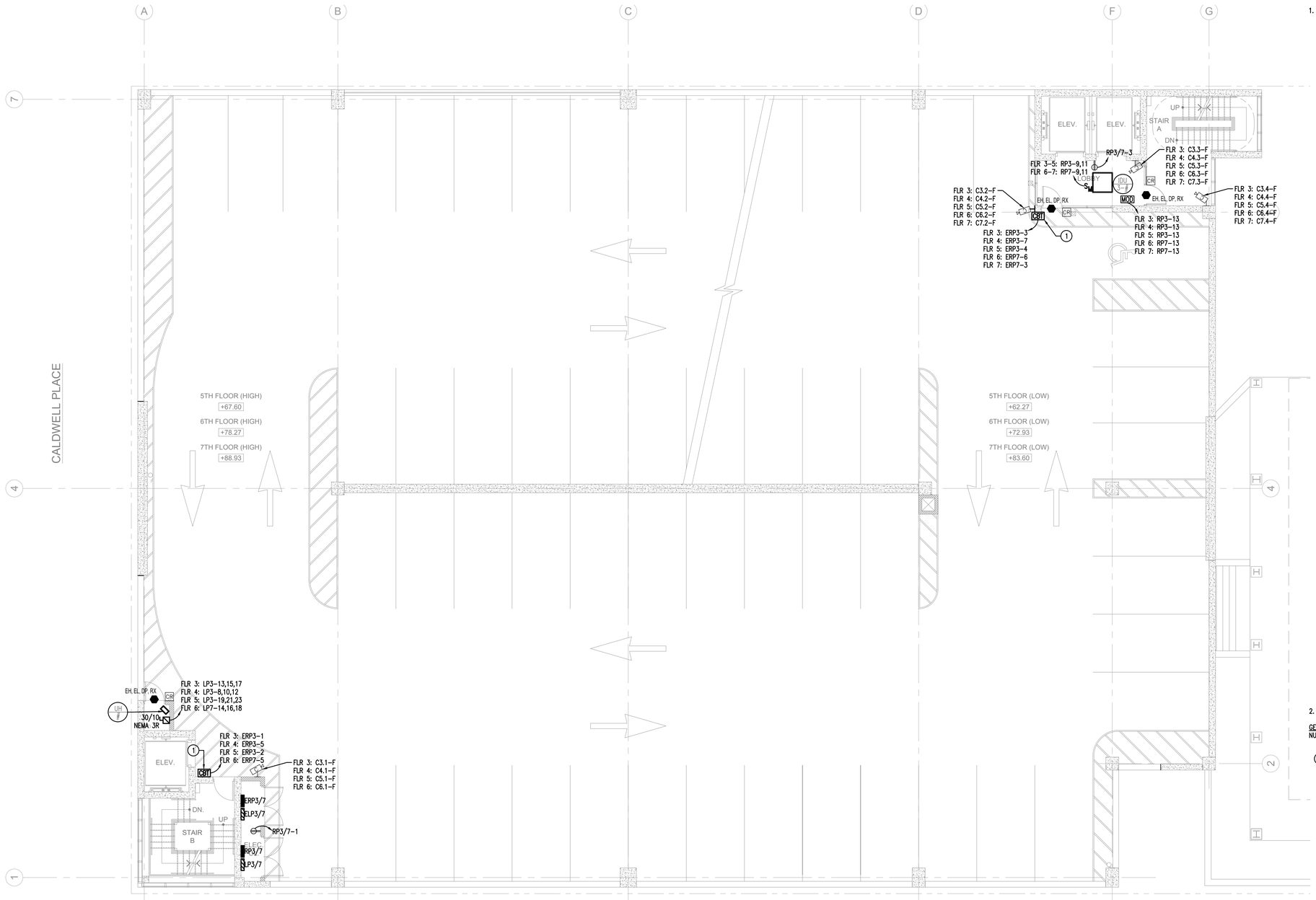
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-102



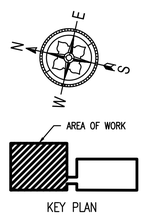
ELIZABETHTOWN PLAZA

1 / E-103 ELECTRICAL – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN – POWER

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (-) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL CODE BLUE TELEPHONE STATION IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE AND INSTALL POWER AND DATA TO EACH CODE BLUE TELEPHONE STATION. COORDINATE FINAL EQUIPMENT SELECTIONS WITH THE OWNERS. PROVIDE REMOTE "CODE BLUE TELEPHONE" SIGN PURCHASED FROM THE MANUFACTURER AND REMOTE CODE BLUE LIGHT TO BE MOUNTED IMMEDIATELY AROUND THE CORNER FROM THE CODE BLUE TELEPHONE MAIN UNIT. COORDINATE FINAL LOCATIONS WITH THE OWNER. BASIS OF DESIGN: MANUFACTURER: AIPHONE; WALL BOX CAT#: WE-HE; INTERNALS CAT#: IX-DVF-RA.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

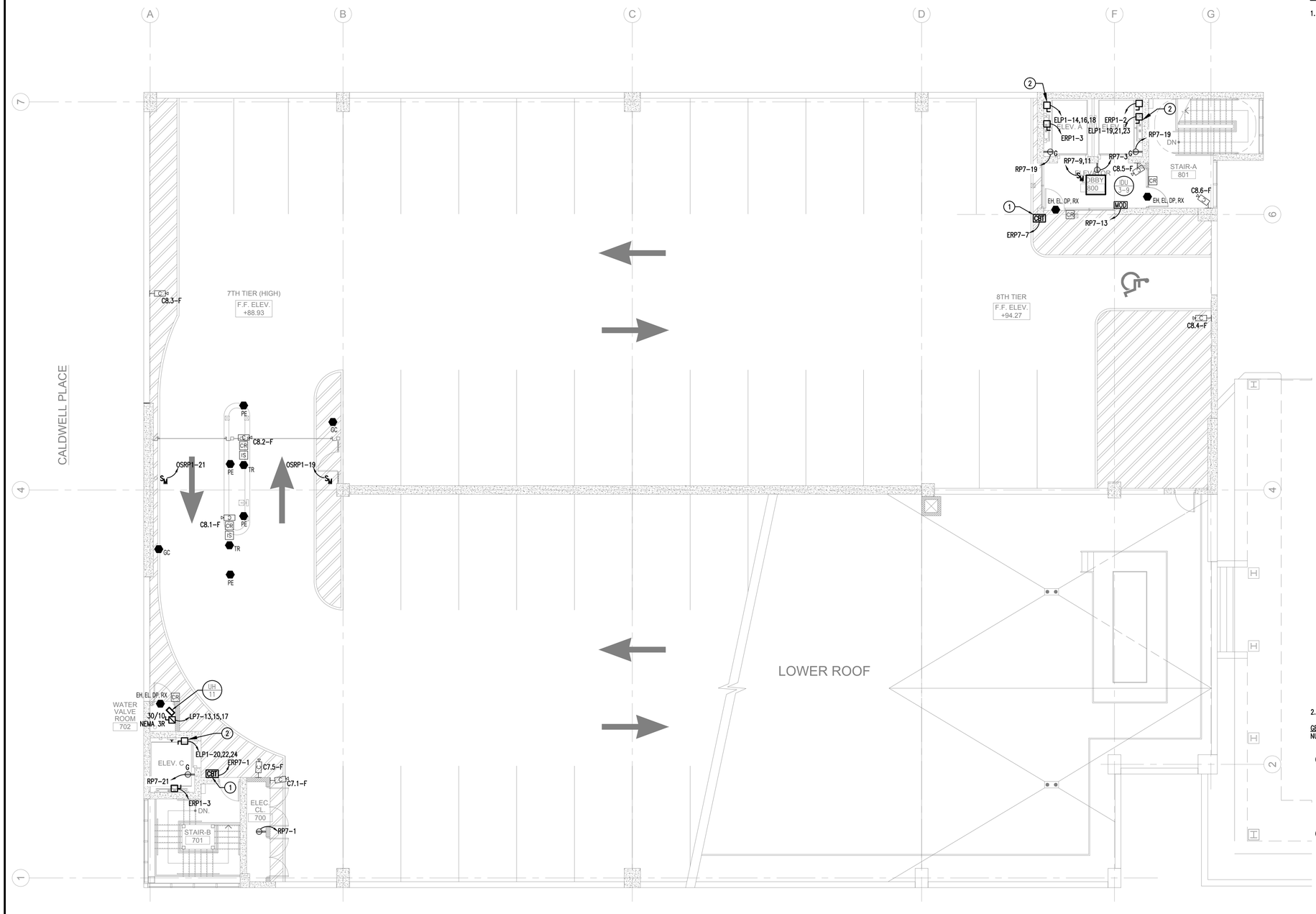
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-103



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (-) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL CODE BLUE TELEPHONE STATION IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE AND INSTALL POWER AND DATA TO EACH CODE BLUE TELEPHONE STATION. COORDINATE FINAL EQUIPMENT SELECTIONS WITH THE OWNERS. PROVIDE REMOTE 'CODE BLUE TELEPHONE SIGN PURCHASED FROM THE MANUFACTURER AND REMOTE CODE BLUE LIGHT TO BE MOUNTED IMMEDIATELY AROUND THE CORNER FROM THE CODE BLUE TELEPHONE MAIN UNIT. COORDINATE FINAL LOCATIONS WITH THE OWNER. BASIS OF DESIGN: MANUFACTURER: AIPHONE; WALL BOX CAT#: WE-HE; INTERNALS CAT#: IX-DVF-RA.

(2) ELEVATOR DISCONNECT SHALL MEET THE REQUIREMENTS OF NEC 620.51. DISCONNECT VOLTAGE AND CURRENT RATINGS FOR MAIN AND AUXILIARY CONTACT RATED FOR USE WITH 24VDC AT UP TO 2 AMPS. ALL ELEVATOR RELATED DISCONNECTS REQUIRE PERMANENTLY-MOUNTED LOCKING MECHANISMS AND SHALL BE CONSPICUOUSLY LABELED WITH ELEVATOR NUMBER, CIRCUITS BEING DISCONNECTED AND LOADS ASSOCIATED WITH THE CIRCUIT BEING DISCONNECTED. THIS INCLUDES MAIN ELEVATOR DISCONNECT, AUXILIARY ELEVATOR DISCONNECT, ELEVATOR LIGHTING CIRCUIT DISCONNECT AND BRANCH CIRCUIT BREAKERS THAT SERVE ANY AND ALL EQUIPMENT WITHIN THE ELEVATOR HOISTWAY.

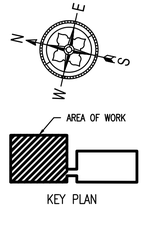
ELIZABETHTOWN PLAZA

1 E-104 ELECTRICAL – NEW GARAGE EIGHTH FLOOR PLAN – POWER

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE EIGHTH FLOOR PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

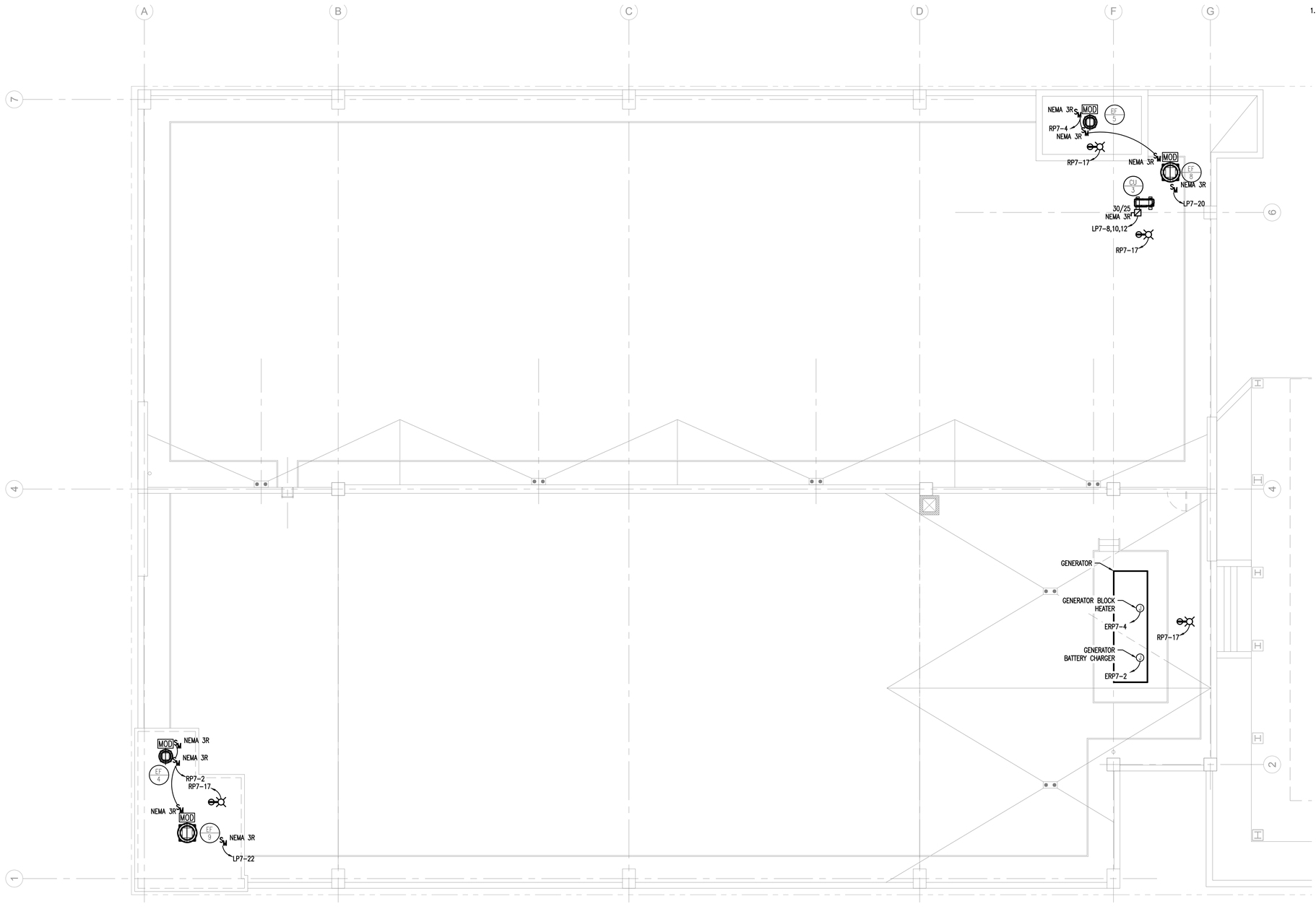
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-104



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

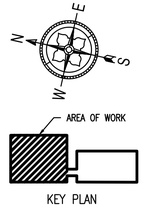
U. THE ELECTRICAL CONTRACTOR TO PROVIDE MOUNTING SUPPORTS FOR ALL DISCONNECT SWITCHES MOUNTED ON ROOF. USE P1000 UNISTRUT FOR ALL INDOOR SUPPORTS AND GALVANIZED P1000 UNISTRUT FOR ALL OUTDOOR SUPPORTS.

1 / E-105 ELECTRICAL – NEW GARAGE ROOF PLAN – POWER

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE ROOF PLAN - POWER

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

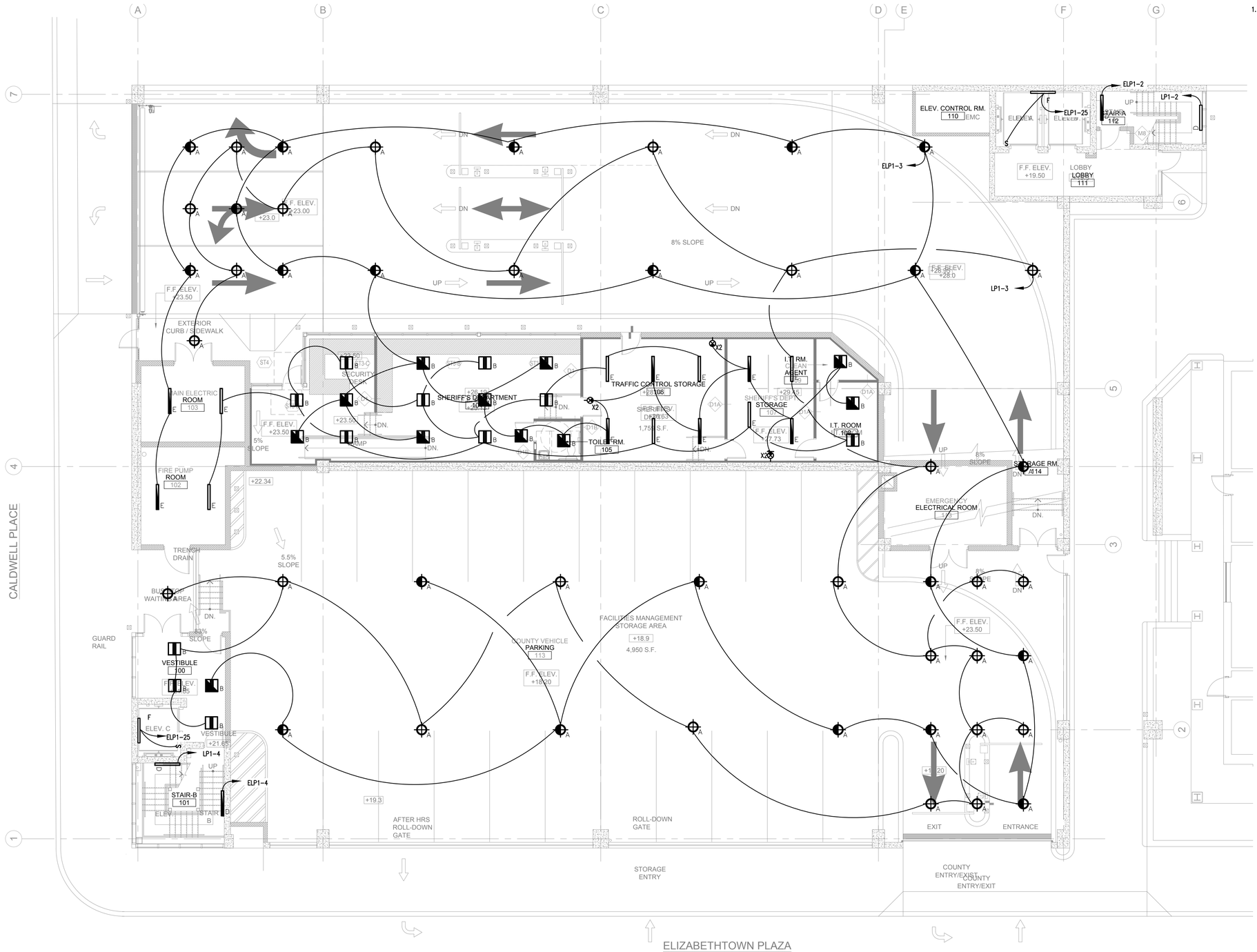
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-105



1 E-201 **ELECTRICAL – NEW GARAGE FIRST FLOOR PLAN – LIGHTING**
SCALE: 1/8"=1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - LIGHTING

PROJECT TITLE:

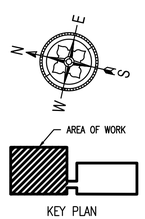
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

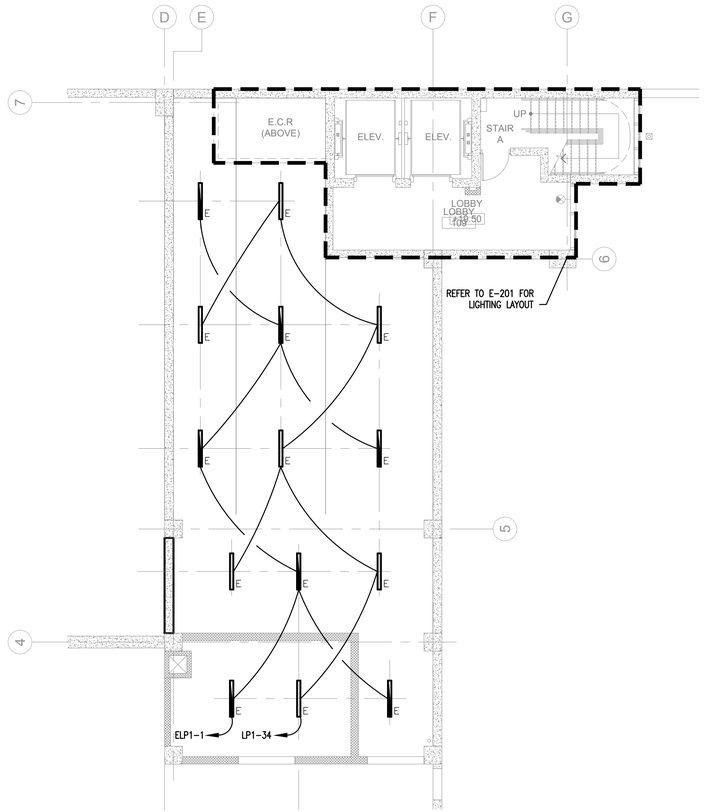
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-201



KEY PLAN



1 / E-201A ELECTRICAL – NEW GARAGE PARTIAL FIRST FLOOR PLAN – LIGHTING

SCALE: 1/8" = 1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

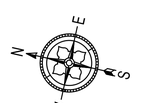
E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

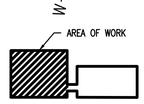
F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.





KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE PARTIAL FIRST FLOOR PLAN - LIGHTING

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:

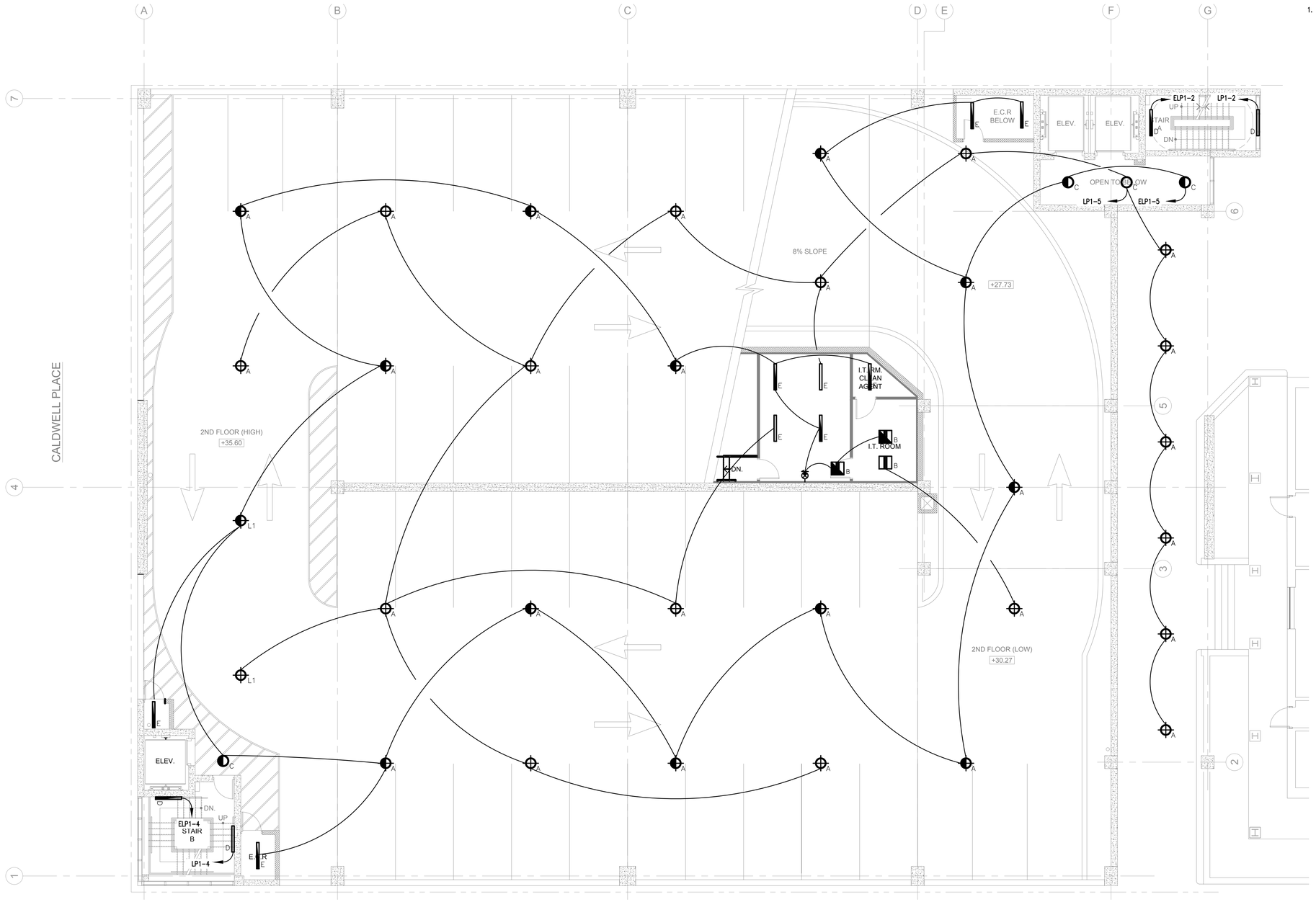
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-201A



ELIZABETHTOWN PLAZA

1 / E-202 ELECTRICAL – NEW GARAGE SECOND FLOOR PLAN – LIGHTING

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

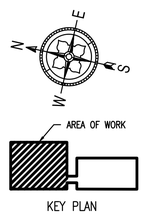
E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - LIGHTING

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

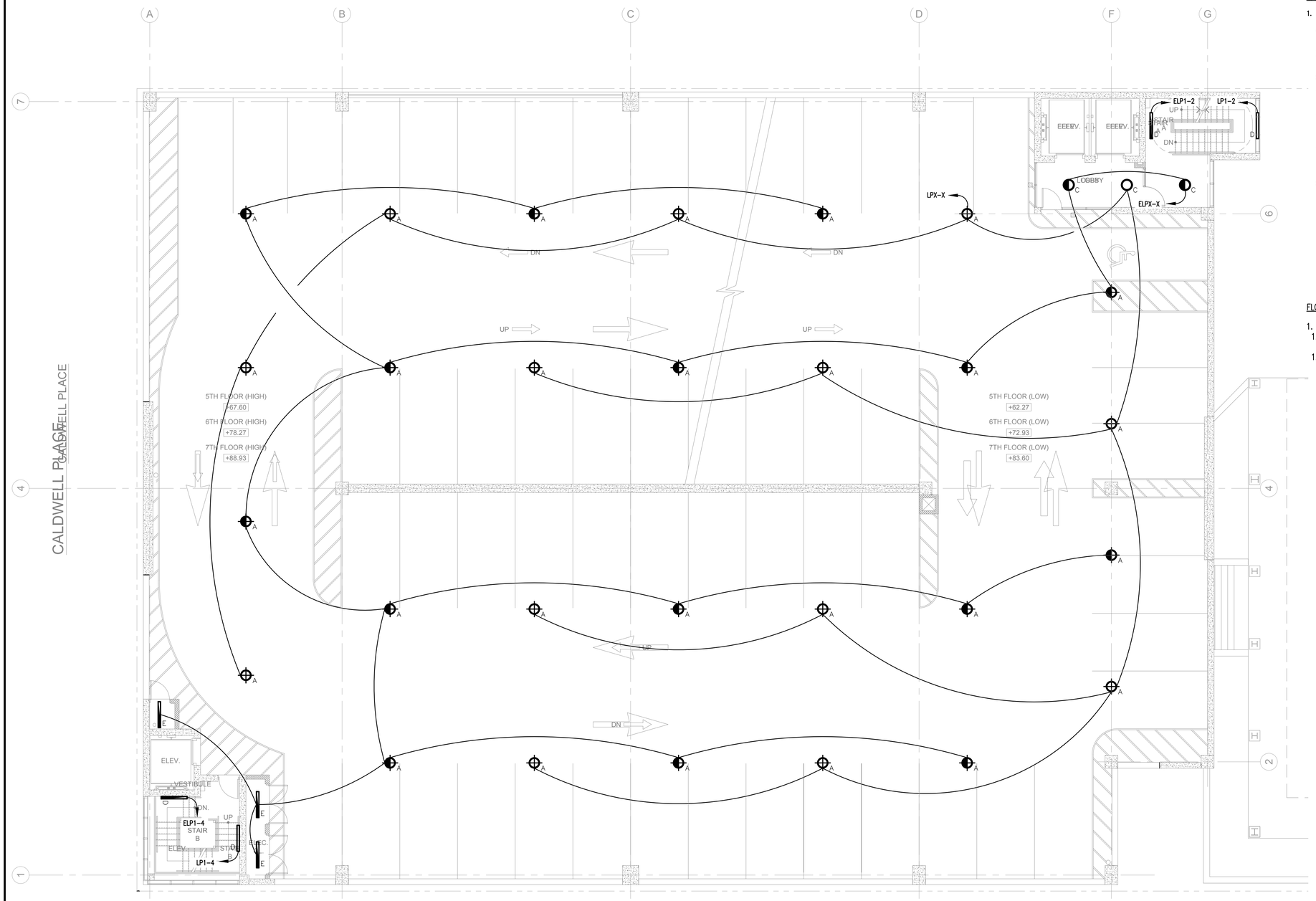
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-202



ELIZABETHTOWN PLAZA

1 E-203 **ELECTRICAL – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN – LIGHTING**

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

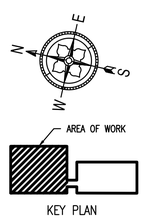
SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:
   - A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.
   - B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.
   - C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.
   - D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.
   - E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.
   - F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
   - G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.
   - H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.
   - I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

FLOORS 3–7 LIGHTING NOTES:

1. FOR ALL 277V NORMAL AND EMERGENCY LIGHTING CIRCUITS, REFER TO:
   - 1.1. 'ELP3' AND 'LP3' PANEL SCHEDULE FOR FLOOR(S) 3–5 RESPECTIVELY.
   - 1.2. 'ELP7' AND 'LP7' PANEL SCHEDULE FOR FLOOR(S) 6–7 RESPECTIVELY.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - LIGHTING

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

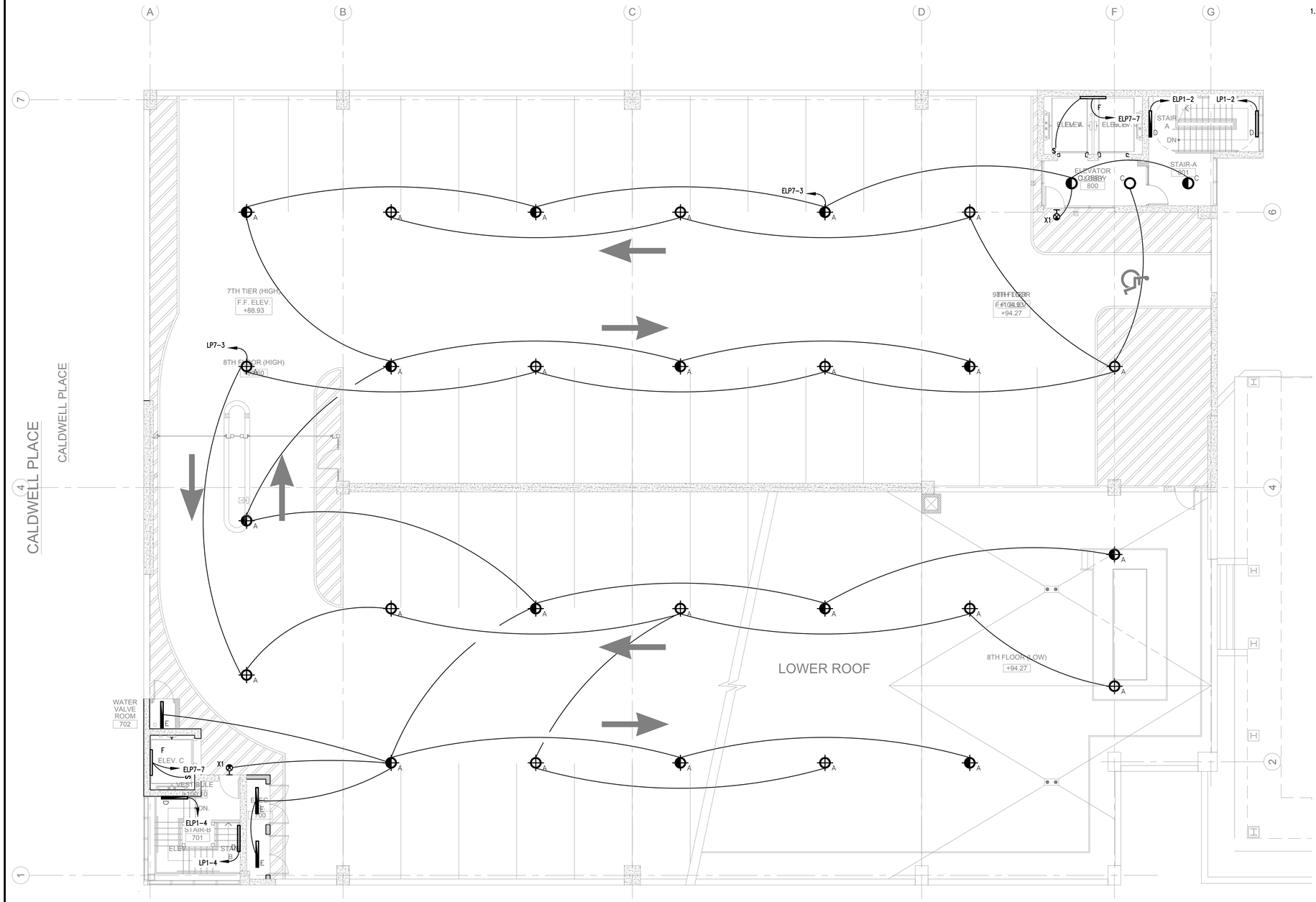
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E–203



ELIZABETHTOWN PLAZA

1 E-204 ELECTRICAL – NEW GARAGE EIGHTH FLOOR PLAN – LIGHTING

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

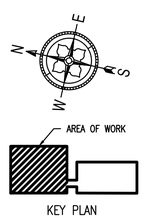
E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE EIGTH FLOOR PLAN - LIGHTING

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

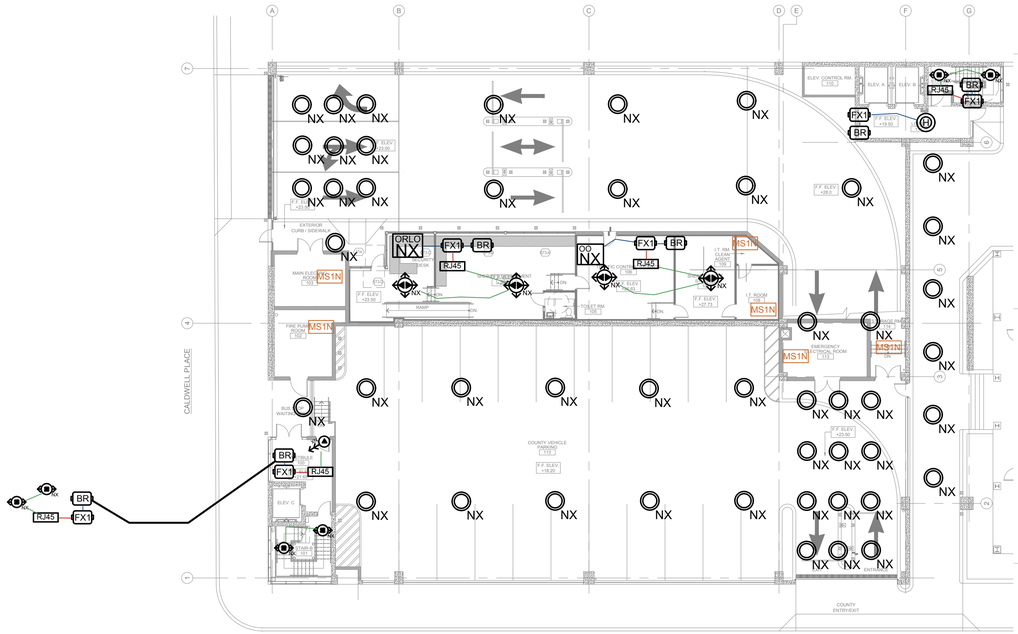
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

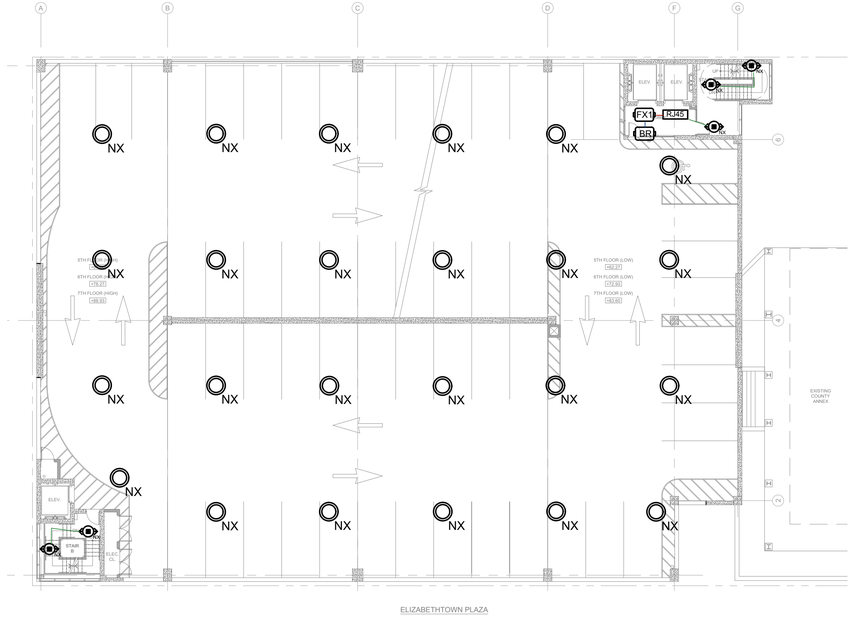
Drawing No.

E-204

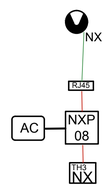


1 E-205 **ELECTRICAL – NEW GARAGE 1ST FLOOR – LIGHTING CONTROLS**
SCALE: NTS

2 E-205 **ELECTRICAL – NEW GARAGE 2ND FLOOR – LIGHTING CONTROLS**
SCALE: NTS



3 E-205 **ELECTRICAL – NEW GARAGE 3RD–8TH FLOOR – LIGHTING CONTROLS**
SCALE: NTS



4 E-205 **EXTERIOR LIGHTING CONTROL DETAIL**
SCALE: NTS

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

J. ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL CAT 6 CABLING REQUIRED BETWEEN LIGHTING CONTROL DEVICES AND ASSOCIATED LIGHTING PANELS AS DEPICTED ON PLAN. COORDINATE MOUNTING LOCATIONS OF EACH DEVICE WITHIN INSTALLED FIXTURES OR REMOTELY AS REQUIRED TO ACCOMPLISH A COMPLETE INSTALLATION. PROVIDE SURFACE MOUNTED RACEWAY BETWEEN DEVICES IN EXPOSED CEILING AREAS WHERE REQUIRED.

HUBBELL Control Solutions

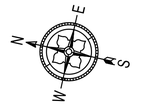
701 Millennium Blvd.
Greenville, SC 29607

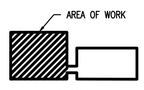
Main Switchboard: (864) 678-1000
Technical Service: (800) 888-8006

www.hubbell.com/hubbellcontrolsolutions/en/

Legend

Quantity	Icon	Model Number	Description
4		LHMTS1-N-WH	LightHAWK2 Neutral Multi-Technology Wall Switch Sensor with IntelliDAPT, Single Circuit, One Button, 120/277VAC, 1000 Sq. Ft., Photocell, White
1	AC	NXAC-UNV-001	NX Area Controller provides real-time programming of the NX Distributed Intelligence Lighting Control System
1	NX	NXDS-O	NX daylight sensor ondoor white.
9		NXHNB2	The NX Network Bridge Module is a key component used in setting up a NX Distributed Lighting Control Network comprised of NX Room Controllers.
1		NXOS-OMDT1	NX CEILING OCC SENSOR, PIR/USONIC1000
4		NXOS-OMDT2	NX CEILING OCC SENSOR, PIR/USONIC2000
21		NXOS-OMUS2	NX CEILING OCC SENSOR USONIC 2000SQ FT
1	NXP 08	NXP2-PNL-8-8-U-S	The NX Distributed Intelligence™ Lighting Control Panel (NXP2 Series) is a robust and reliable panel that can operate standalone or as a NX networked device.
9		NXRCFX-1RD-UNV	The NX Room Controller is the central component of the NX room control solution.
1		NXSMP-HMO	The NXSMP High Mount Sensor Module provides a unique solution for integrating automatic control functions directly into a luminaire.
146	NX	NXSMP-OMNI	The NXSMP-OMNI Module provides a unique solution for integrating automatic control functions directly into a luminaire.
1	NX	NXSW-OO-WH	NX Digital Switch Station, On/Off, White
1	NX	NXSW-ORLO-WH	NX Digital Switch Station, On/Raise/Lower/Off, White
1	NX	NXSW-TH3-WH	NX Specialty Switch Stations
9		RJ45ADAPTER	Hubbell Control Solutions' RJ45 Adapter is designed to be used with HCS low voltage occupancy and daylight sensors.





KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE - LIGHTING CONTROLS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

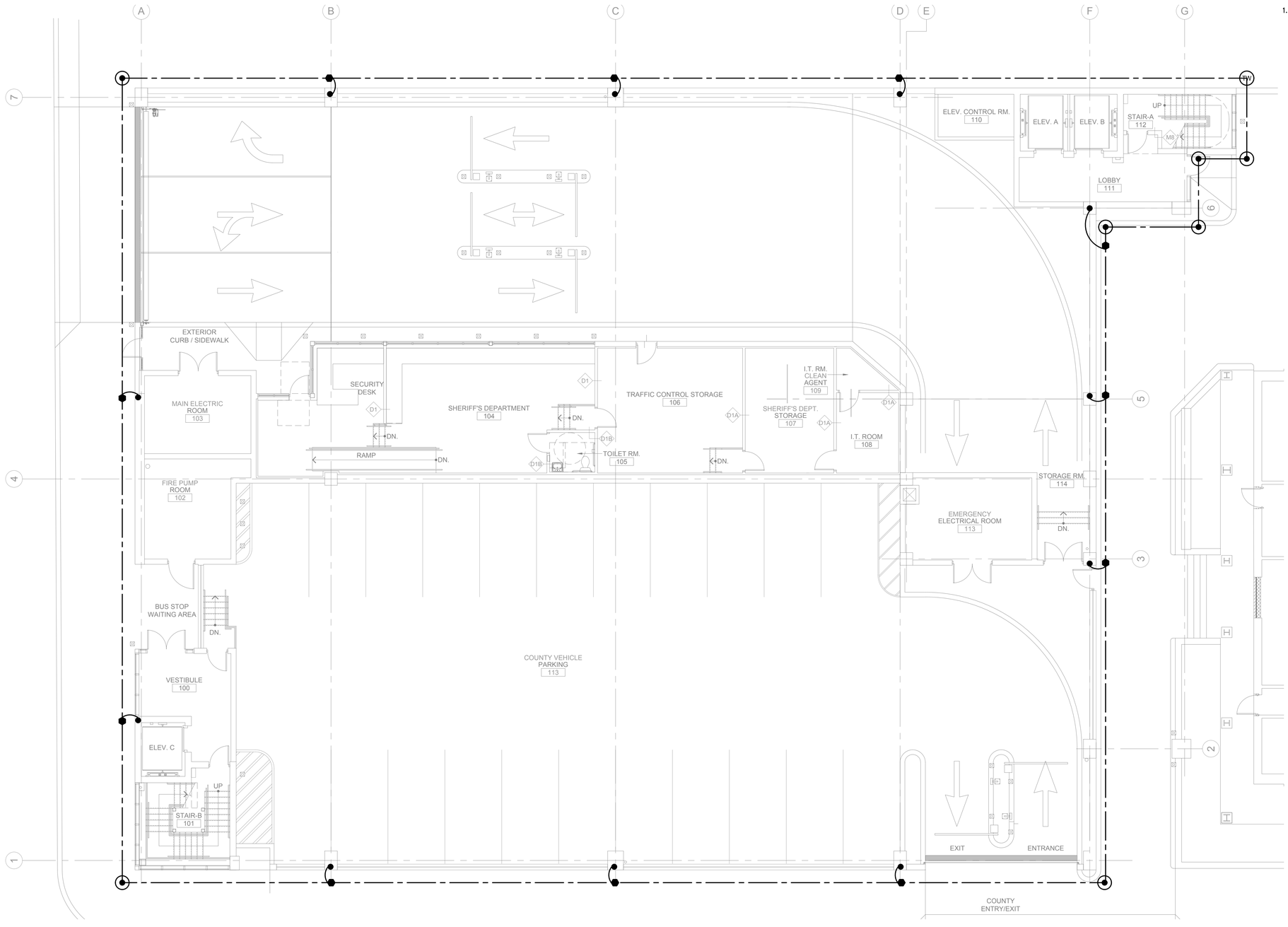
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

E-205



1 E-300 **ELECTRICAL – NEW GARAGE FIRST FLOOR PLAN – GROUNDING**

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

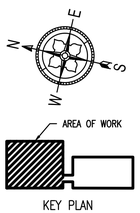
E. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CONDUITS, RACEWAYS, CONDUCTORS, AND OTHER EQUIPMENT NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM.

F. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

G. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

H. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

I. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - GROUNDING

PROJECT TITLE:

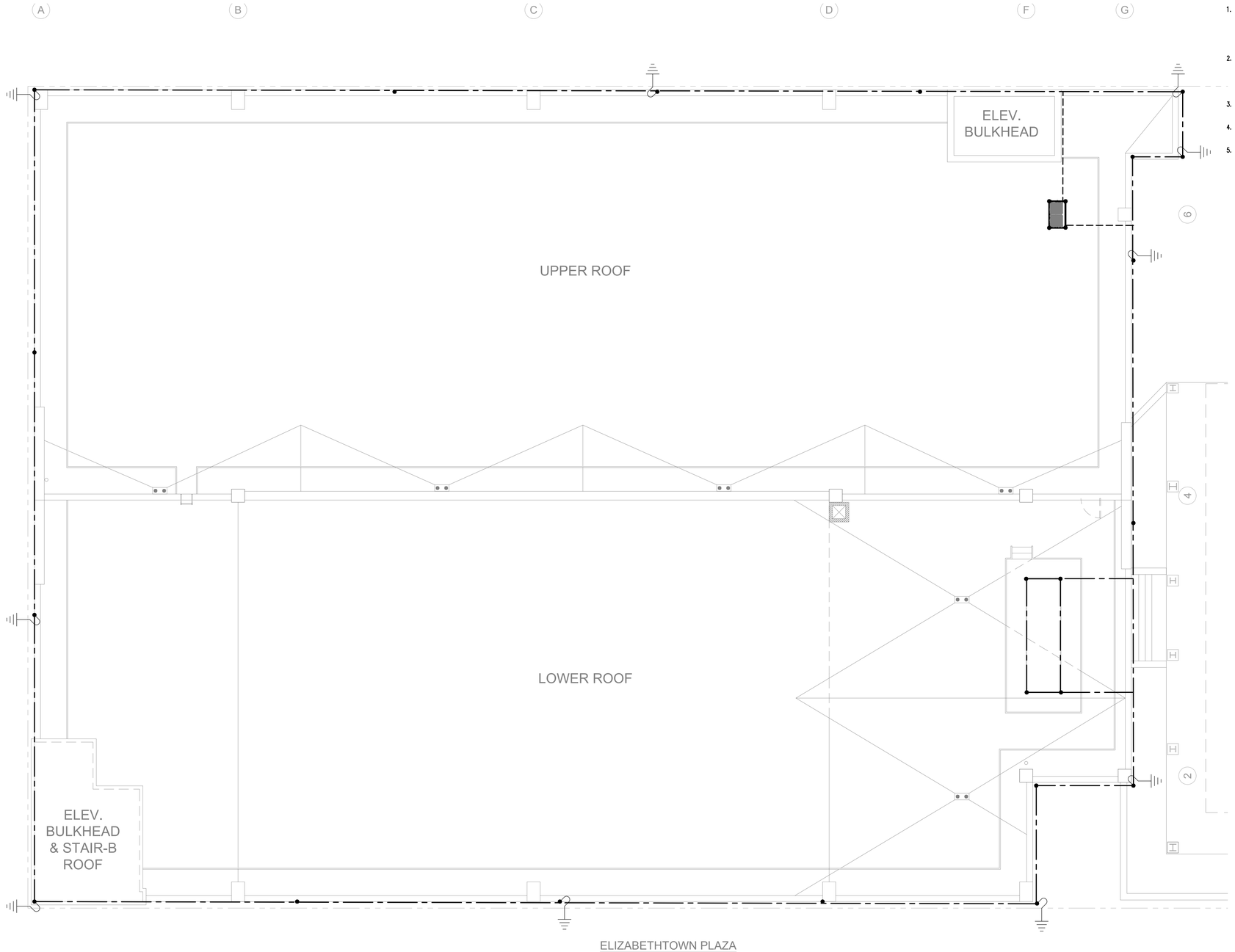
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-300

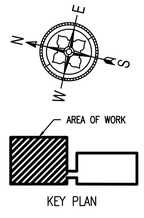


GENERAL LIGHTNING PROTECTION SYSTEM NOTES:

1. THIS DRAWING IS DIAGRAMMATIC AND INDICATES THE VARIOUS ELEMENTS FOR THE LIGHTNING PROTECTION SYSTEM. LIGHTNING PROTECTION SYSTEM ELEMENTS INCLUDE BUT ARE NOT LIMITED TO: INTERCONNECTED ROOF-TOP AIR TERMINALS, GROUNDING TERMINATIONS, CONDUCTORS INTERCONNECTING THE ROOF-TOP AIR TERMINALS & GROUNDS, BUILDING GROUNDING LOOP, METALLIC BODY INTERCONNECTIONS, AND SURGE SUPPRESSION.
2. IN ACCORDANCE WITH SPECIFICATION SECTION 264113, SUBMIT FOR REVIEW BY THE ENGINEER, A COMPLETE SUBMITTAL PACKAGE DETAILING THE PROPOSED LIGHTNING PROTECTION SYSTEM AND COMPONENTS. THE SUBMITTAL SHALL BE BASED ON ACTUAL ARCHITECTURAL ROOF PLANS AND SECTIONS, ARCHITECTURAL ELEVATION DRAWINGS, AND ROOF MOUNTED EQUIPMENT. THE PROPOSED LIGHTNING PROTECTION SYSTEM SHALL BE IN ACCORDANCE WITH NFPA 780 GUIDELINES & UL96A.
3. UPON COMPLETION OF THE LIGHTNING PROTECTION SYSTEM INSTALLATION, APPLICATION SHALL BE MADE TO UNDERWRITERS LABORATORIES, INC. FOR INSPECTION AND ISSUANCE OF THE UL MASTER LABEL.
4. PROVIDE TRANSIENT VOLTAGE SURGE PROTECTION DEVICES FOR ALL INCOMING BUILDING SERVICES. THIS INCLUDES BUT IS NOT LIMITED TO ELECTRICAL SERVICE, TELECOMMUNICATIONS SERVICES, CABLE SERVICE, ETC.
5. REFER TO SHEET E-300 FOR BUILDING GROUND RING REQUIREMENTS. THE LIGHTNING PROTECTION SYSTEM SHALL BE COMMONLY BONDED TO THE BUILDING GROUND RING.

1 / E-301 **ELECTRICAL – NEW GARAGE ROOF PLAN – LIGHTNING PROTECTION**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE ROOF PLAN - LIGHTNING PROTECTION

PROJECT TITLE:

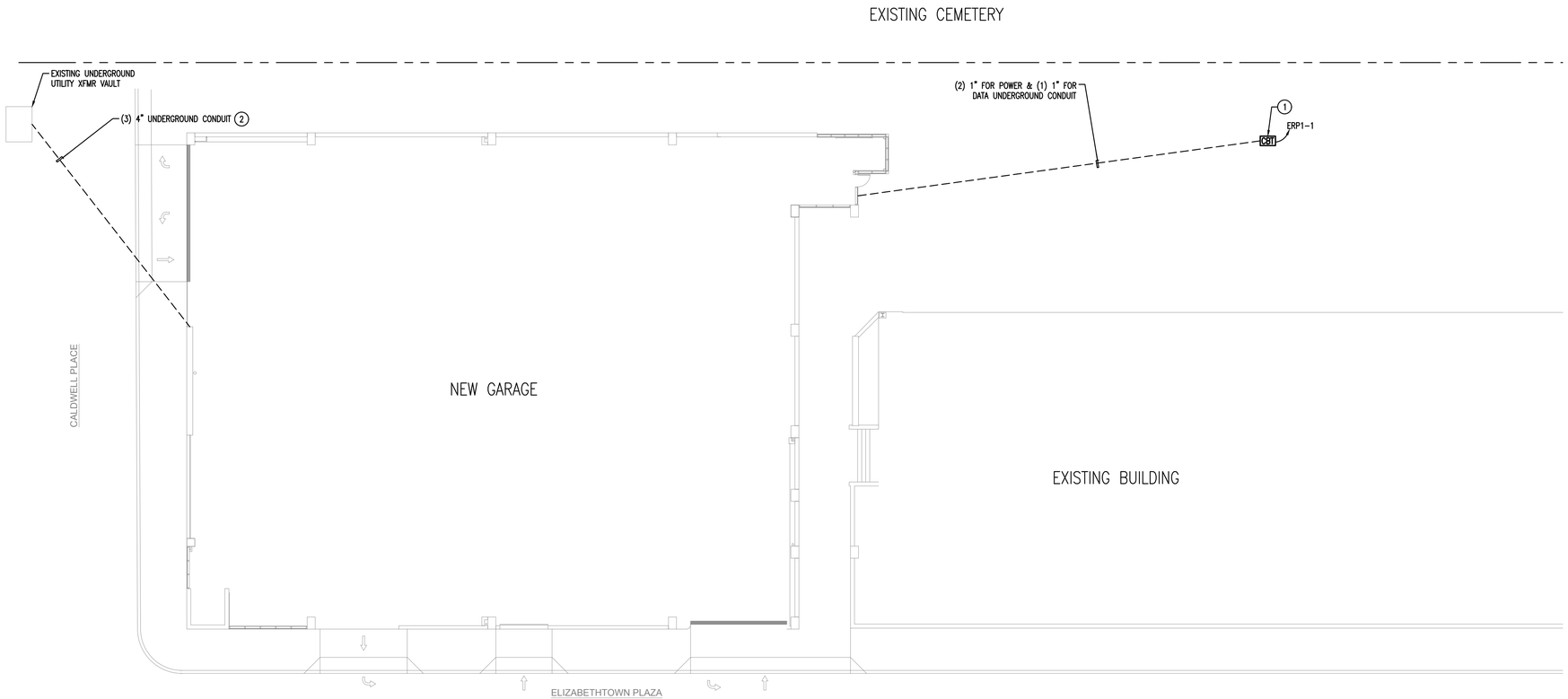
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-301



1 E-400 **ELECTRICAL SITE PLAN**
SCALE: NTS

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:

A. REFER TO ELECTRICAL LEAD SHEETS, E-001 FOR "NOTES" THAT PERTAIN TO THE SCOPE OF THIS PROJECT.

B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.

C. REFER TO DRAWING E-008 THROUGH E-009 FOR PANEL SCHEDULES.

D. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

E. ELECTRICAL CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

F. ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT, WIRING AND RACEWAY, AND MAKE ALL CONNECTIONS TO/FROM PANELBOARDS, DISCONNECT SWITCHES, ADJUSTABLE SPEED DRIVES, MOTOR STARTERS, AND THE END USE EQUIPMENT NECESSARY FOR A FULLY OPERATIONAL SYSTEM. COORDINATE WITH MECHANICAL CONTRACTOR.

G. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

H. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE OWNER'S REPRESENTATIVE.

I. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

J. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

K. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

M. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

N. THE ELECTRICAL SYSTEM SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

O. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

P. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

Q. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE "MC" WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

R. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

S. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

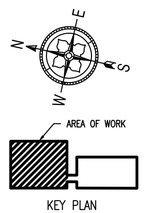
T. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (-) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL NEW EXTERIOR CODE BLUE TELEPHONE STATION IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE AND INSTALL UNDERGROUND POWER AND DATA CODE BLUE TELEPHONE STATION. COORDINATE FINAL EQUIPMENT SELECTIONS WITH THE OWNERS. COORDINATE FINAL LOCATION WITH THE OWNER. BASIS OF DESIGN: MANUFACTURER: AIPHONE; TOWER CAT#: TW-20B/A; TOWER LIGHT CAT#: TW-LCB; INTERNALS CAT#: IX-DVF-RA.

(2) PROVIDE (3) 4" CONDUIT FOR NEW ELECTRICAL SERVICE TO NEW GARAGE FROM EXISTING UTILITY TRANSFORMER VAULT. COORDINATE FINAL CONNECTION REQUIREMENTS WITH UTILITY.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL SITE PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
E-400

ABBREVIATIONS

ABV	ABOVE
ACCOM	ACCOMMODATE
AD	ACCESS DOOR
ATMOS	ATMOSPHERE
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATE
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARRG	ARRANGEMENT
ATP	AUTOMATIC TRAP PRIMER
BLDG	BUILDING
BLW	BELOW
BTU	BRITISH THERMAL UNIT
BV	BUTTERFLY VALVE
C	COMMON
CAB	CABINET
CAP	CAPACITY
CFH	CUBIC FEET PER HOUR
℄	CENTER LINE
CLG	CEILING
CO	CLEAN OUT
COL	COLUMN
CON	CONCENTRIC
CONC	CONCRETE
CD	CONDENSATE DRAIN
CONN	CONNECTION
CONT	CONTINUATION
CONTR	CONTRACTOR
CU	CUBIC
CW	COLD WATER
DEPT	DEPARTMENT
DFU	DRAINAGE FIXTURE UNIT
DIA	DIAMETER
DIAG	DIAGRAM
DISCH	DISCHARGE
DN	DOWN
DWG	DRAWING
(E)	EXISTING TO REMAIN
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRIC
ELEV	ELEVATOR
EQUIP	EQUIPMENT
EXPAN	EXPANSION
F°	DEGREES FAHRENHEIT
FAI	FRESH AIR INLET
FC	FLOOR CLEANOUT
FD	FLOOR DRAIN
FIN	FINISHED
FLR	FLOOR
FM	FORCED MAIN
FP	FIRE PROTECTION
G	GUIDE/S
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPD	GALLONS PER DAY
GCO	GRADE CLEANOUT
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H	HEIGHT
HB	HOSE BIBB
HD	HEAD
HP	HORSEPOWER
HR	HOUR
HTR	HEATER
HW	HOT WATER
HZ	HERTZ
ID	INTERNAL DIAMETER
IDW	INDIRECT WASTE
IN	INCHES
INV	INVERT
KW	KILOWATT
LVG	LEAVING
MAX	MAXIMUM
MBH	THOUSANDS OF BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MED	MEDIUM
MFR	MANUFACTURER
MIN	MINIMUM
MTD	MOUNTED
(N)	NEW
NIC	NOT IN CONTRACT
No	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OD	OVERFLOW DRAIN
PC	PLUMBING CONTRACTOR
PERF	PERFORATED
PEX	PEX PIPING
PEX-MF	PEX PIPING MANIFOLD
PH	PHASE
PRESS	PRESSURE
PSI	POUNDS PER SQUARE INCH
QUAN	QUANTITY
(R)	REMOVE EXISTING
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
(RE)	RELOCATE EXISTING
REQ	REQUIRED
RET	RETURN
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RWC	RAINWATER CONDUCTOR
SAN	SANITARY
SCH	SCHEDULE
SCHEM	SCHEMATIC
SFU	SUPPLY FIXTURE UNIT
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
SS	SERVICE SINK
ST.STL.	STAINLESS STEEL
ST	STORM
STL	STEEL
TD	TRENCH DRAIN
TEMP	TEMPERATURE
TP	TOTAL PRESSURE
TYP	TYPICAL
V	VENT
VCO	VERTICAL CLEANOUT
VEL	VELOCITY
VOLT	VOLTAGE
VTR	VENT THRU ROOF
W	WIDTH
W/	WITH/WIDE
W/O	WITHOUT
WC	WATER COLUMN
WCO	WALL CLEANOUT
WG	WATER GAUGE

HANGERS & SUPPORTS

1. HANGERS AND ANCHORS SHALL BE SECURELY ATTACHED TO BUILDING CONSTRUCTION AT SUFFICIENTLY CLOSE INTERVALS TO SUPPORT PIPING AND ITS CONTENTS.
   A. VERTICAL PIPING FOR CAST IRON SHALL BE SUPPORT AT BASE AND AT EACH STORY HEIGHT.
   B. VERTICAL PIPING FOR COPPER SHALL BE SUPPORTED AT EACH STORY HEIGHT BUT NOT MORE THAN 10 FOOT INTERVALS.
   C. HORIZONTAL PIPING FOR COPPER SHALL BE SUPPORTED AT 6 FOOT INTERVALS FOR PIPE SIZES 1-1/4" AND SMALL AND AT 10 FOOT INTERVALS FOR PIPE SIZES 1-1/2" AND LARGER. WHERE PIPE IS SUSPENDED BY NON-RIGID HANGERS MORE THAN 18" LONG, PROVIDE LATERAL SUPPORT.
2. ALL SUPPORTS IN CONTACT WITH COPPER PIPING SHALL BE PLASTIC COATED.
3. INSTALL METAL SHIELDS ON HANGERS SUPPORTING INSULATED PIPE.
4. ALL DOMESTIC WATER AND SANITARY WASTE PIPE SUPPORTS SHALL BE IN ACCORDANCE WITH NSPC CHAPTER 8 MSS SP-58, 69 & 89.
5. PLUMBING SYSTEMS SHALL BE INSTALLED SO AS TO PREVENT STRAINS & STRESS WHICH WILL EXCEED STRUCTURAL STRENGTH OF PIPE. PROVISIONS SHALL BE MADE FOR EXPANSION & CONTRACTION OF PIPING.
6. HANGERS, ANCHORS, AND SUPPORTS SHALL BE OF METAL. OTHER MATERIAL OF SUFFICIENT STRENGTH TO SUPPORT THE PIPING AND ITS CONTENTS IS ACCEPTABLE. ALL SUPPORTS AND FASTENERS LOCATED OUTSIDE OR IN CORROSIVE AREAS SHALL BE GALVANIZED.
7. MINIMUM ROD DIAMETER FOR SINGLE RIGID SUPPORTS SHALL BE AS FOLLOW:
   FOR 1-1/4" THRU 2" PIPE: 3/8" DIAMETER
   FOR 2-1/2" AND 3" PIPE: 1/2" DIAMETER
   FOR 4" AND 5" PIPE: 5/8" DIAMETER
   FOR 6" PIPE: 3/4" DIAMETER
   FOR 8" PIPE: 7/8" DIAMETER
   FOR 14" THRU 18" PIPE: 1" DIAMETER
   RODS MAY BE REDUCED ONE SIZE FOR DOUBLE ROD HANGERS (3/8" DIA. MIN.)

AVAILABLE WATER PRESSURE DATA

NJAWC HYDRANT TEST #5561
DATE: 06/26/2020
FLOW STREET: RAHWAY AVENUE
FLOW HYDRANT #: 27190
STATIC PRESSURE: 55 PSI
RESIDUAL PRESSURE: 50 PSI
FLOW: 1126 GPM

LINE DESIGNATIONS

- VENT LINE
- DOMESTIC COLD WATER
- DOMESTIC HOT WATER – 110°F
- DOMESTIC HOT WATER RECIRCULATING
- 140°F — DOMESTIC HOT WATER – 140°F
- DIRECTION OF FLOW ARROW
- ST — STORM LINE (ABOVE SLAB/ABOVE FIN. CLG.)
- SAN — SANITARY LINE (ABOVE SLAB/ABOVE FIN. CLG.)
- ST — STORM LINE (BELOW SLAB)
- SAN — SANITARY LINE (BELOW SLAB)
- G — GAS LINE (ABOVE SLAB/ABOVE FIN. CLG.)

PLUMBING SYMBOLS

- WHA — WATER HAMMER ARRESTER
- NFWH — WALL HYDRANT (NON-FREEZE)
- FD — FLOOR DRAIN
- FLOOR / WALL — FCO / CO / WCO — CLEANOUT
- CAP
- CHECK VALVE
- BALANCING VALVE
- GAS COCK
- THERMOSTATIC MIXING VALVE
- TEMPERATURE & PRESSURE RELIEF VALVE
- STRAINER
- PIPE RISING UP
- PIPE DROPPING DOWN
- UNION
- THERMOMETER
- GA — GAUGE WITH GAUGE COCK & SNUBBER (WATER)
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- RPZ/BACKFLOW PREVENTER

MISC. DWG. SYMBOLS

- POINT OF CONNECTION
- POINT OF DISCONNECT
- POINT OF CONNECTION FOR FUTURE WORK
- EQUIPMENT SYMBOL
- EQUIPMENT NUMBER OR FLOW (GPM,CFM,ETC.)
- DETAIL NUMBER
- DETAIL DRAWING NUMBER
- SECTION LETTER
- SECTION DRAWING NUMBER
- PLAN NUMBER
- PLAN DRAWING NUMBER
- KEYED DEMOLITION NOTE
- KEYED NEW WORK NOTE

NOTES

THE FOLLOWING NOTES APPLY TO ALL "P" PLUMBING DRAWINGS:

1. THE ENTIRE PLUMBING INSTALLATION SHALL CONFORM TO THE NATIONAL STANDARD PLUMBING CODE 2018 EDITION, INTERNATIONAL FUEL GAS CODE "2018" EDITION, 2018 FGI GUIDELINES AND LOCAL AUTHORITIES HAVING JURISDICTION AND THE CITY OF ELIZABETH, NJ. NOTIFY CITY BUILDING CODE ENFORCEMENT FOR ALL REQUIRED INSPECTIONS.
2. PRIOR TO STARTING CONSTRUCTION, DETERMINE EXACT INVERT ELEVATION, SIZE, DEPTH AND LOCATION OF NEW UTILITIES WHERE CONNECTIONS ARE TO BE MADE OR INTERSECTIONS OCCUR. NOTIFY ARCHITECT OR ENGINEER OF ANY DISCREPANCY BETWEEN DRAWINGS AND ACTUAL FIELD CONDITIONS. WORK BACK TOWARD BUILDING FROM UTILITY CONNECTION FOR ALL PIPING SYSTEMS.
3. VERIFY WITH OWNER, PRIOR TO STARTING CONSTRUCTION, THE LOCATION OF ALL ON-SITE UNDERGROUND UTILITIES THAT WILL BE AFFECTED BY THIS WORK.
4. INSTALL ALL WATER HAMMER ARRESTORS IN ACCORDANCE WITH THE LATEST "PLUMBING AND DRAINAGE INSTITUTE STANDARDS" FOR WATER HAMMER ARRESTORS.
5. PROVIDE AND LOCATE ACCESS PANELS IN NON ACCESSIBLE CEILINGS AND WALLS FOR ALL VALVES, WATER HAMMER ARRESTORS, CLEANOUTS AND ALL OTHER ITEMS THAT REQUIRE ACCESS TO PROPERLY MAINTAIN OR SERVICE THE BUILDING.
6. COORDINATE PLUMBING WORK WITH ALL OTHER TRADES FOR CLEARANCES, ACCESS AND STRUCTURAL INTERFERENCES PRIOR TO INSTALLATION OF ANY SYSTEMS.
7. DOMESTIC WATER PIPE FOR ABOVE GROUND USE SHALL BE ASTM B88 TYPE "L" SEAMLESS COPPER TUBE WITH SOLDER JOINT FITTINGS USING 95-5 SOLDER PER ASTM B32. ALL WATER SERVICE PIPING SHALL BE WATER RATED FOR NOT LESS THAN 200 PSI @ 73°F. ALL WATER DISTRIBUTION PIPING SHALL BE WATER RATED FOR NOT LESS THAN 100 PSI @ 180°F.
8. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. ROUTING IS DIAGRAMMATIC AND APPROXIMATE. ALL REQUIRED OFFSETS, RISE AND DROPS ARE NOT NECCESSARILY SHOWN. SUBMISSION BY THE PLUMBING CONTRACTOR SHALL BE CONSTRUED AS EVIDENCE THAT THE P.C. HAS INCLUDED IN HIS OR HER BID PRICE, INSTALLATION OF ALL PLUMBING SYSTEMS COORDINATED WITH G.C. AND ALL TRADES.
9. DOMESTIC WATER PIPING SHALL BE FLUSHED WITH WATER UNTIL NO DIRTY WATER APPEARS AT THE POINTS OF OUTLETS.
10. POTABLE WATER PIPING SHALL BE DISINFECTED PRIOR TO USE PER NATIONAL STANDARD PLUMBING CODE. THE PIPING SHALL BE FILLED WITH A WATER CHLORINE SOLUTION CONTAINING AT LEAST 50 PARTS PER MILLION OF CHLORINE AND SHALL BE VALVED OFF FOR 24 HOURS OR FILLED WITH A WATER CHLORINE SOLUTION CONTAINING AT LEAST 200 PARTS PER MILLION OF CHLORINE AND ALLOWED TO STAND FOR AT LEAST 3 HOURS. FOLLOWING THE ALLOWED STANDING TIME, THE SYSTEM SHALL BE FLUSHED WITH POTABLE WATER UNTIL NO CHLORINE REMAINS IN THE SYSTEM. PROVIDE RESULTS OF DISINFECTION TO OWNER WHEN COMPLETE. STERILIZATION WORK SHALL COMPLY WITH NSPC 2015 SECTION 10.9.2, PARAGRAPH A1 TO A9.
11. DOMESTIC WATER PIPE SHALL CONSIST A HYDROSTATIC PRESSURE TEST OF 25 PSIG ABOVE THE WORKING PRESSURE UNDER WHICH IT IS OPERATED FOR NOT LESS THAN 60 MIN.
12. IF LEAKS OCCUR DURING TESTING, REPAIRS SHALL BE MADE AND SYSTEM RETESTED UNTIL NO EVIDENCE OF LEAKS EXIST FOR THE DUREATION OF THE TEST.
13. DOMESTIC WATER PIPE SHALL BE INSULATED WITH 1" THICK FIBERGLASS PREFORMED INSULATION WITH VAPOR JACKET AND SELF SEALING TAPE, EQUAL TO OWENS-CORNING ASJ/SSL-2. PIPING IN EXTERIOR WALLS SHALL HAVE 2" THICK INSULATION. DOMESTIC WATER PIPE MAY BE INSULATED WITH AP/ARMAFLEX SS (SELFSEAL) FLEXIBLE ELASTOMERIC THERMAL INSULATION, 1/2" THICKNESS, OR APPROVED EQUAL. PIPING IN EXTERIOR WALLS SHALL HAVE 1" THICK INSULATION.

PLUMBING DEMOLITION NOTES

1. EXISTING SERVICES INDICATED ON THESE DRAWINGS WERE DERIVED FROM EXISTING DRAWINGS AND LIMITED FIELD OBSERVATIONS. THESE DRAWINGS MAY NOT BE INCLUSIVE OF SERVICES THAT EXIST IN THE PROJECT AREA. CONTRACTOR SHALL VERIFY SERVICES, LOCATION, TYPE, AND SIZE PRIOR TO ANY CONSTRUCTION. DEVIATIONS IMPACTING WORK SHOWN ON THESE DOCUMENTS SHALL BE REPORTED TO THE ARCHITECT FOR COORDINATION PRIOR TO CONSTRUCTION.
2. EXISTING SERVICES, EQUIPMENT, AND FIXTURES TO REMAIN OR TO BE RELOCATED SHALL BE REPAIRED TO ORIGINAL OPERATION OR REPLACED, SHOULD THEY BE DAMAGED DURING CONSTRUCTION.
3. ALL EXISTING WORK NOT SHOWN ON THESE DRAWINGS (UNLESS NOTED OTHERWISE) SHALL REMAIN AS IS.
4. ALL PENETRATIONS OR OPENINGS FROM REMOVED PIPES THROUGH EXISTING BUILDING WALLS AND FLOORS SHALL BE SLEEVED AND/OR PATCHED TO MATCH ORIGINAL. SEE ARCHITECTURAL DRAWINGS FOR FINAL FINISHES.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING PIPING, FIXTURES, MED GAS OUTLETS OR EQUIPMENT DUE TO NEW CONSTRUCTION AND SHALL RESTORE EXISTING WORK TO ITS ORIGINAL CONDITION AT NO COST TO THE OWNER.
6. CONTINUITY OF SERVICES: EXISTING BUILDING WILL REMAIN IN USE DURING CONSTRUCTION OPERATIONS. WHEN AN INTERRUPTION OF AN EXISTING SERVICE IS NECESSARY, CONTRACTOR SHALL COORDINATE WITH AUTHORIZED HOSPITAL PERSONNEL BEFORE MAKING THE NECESSARY INTERRUPTION.
7. COORDINATE ALL PLUMBING DEMOLITION AND NEW WORK WITH PHASING NOTES ON ARCHITECTURAL DRAWING A-007.

DRAWING LIST

UNION COUNTY PARKING GARAGE

SHEET NO.	DRAWING NUMBER	DRAWING TITLE	DATE	ISSUE	ISSUED FOR BIDDING	
			07/28/2021			
		PLUMBING				
1	P-001	PLUMBING LEAD SHEET		X		
2	PD-100	PLUMBING - EXISTING GARAGE BASEMENT DEMOLITION PLAN		X		
3	PD-101	PLUMBING - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN		X		
4	PD-102	PLUMBING - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN		X		
5	P-101	PLUMBING - NEW GARAGE FIRST FLOOR PLAN		X		
6	P-102	PLUMBING - NEW GARAGE SECOND FLOOR PLAN		X		
7	P-103	PLUMBING - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN		X		
8	P-104	PLUMBING - NEW GARAGE EIGHTH FLOOR PLAN		X		
9	P-105	PLUMBING - NEW GARAGE ROOF PLAN		X		
10	P-300	PLUMBING SCHEDULES		X		
11	P-400	PLUMBING DETAILS		X		
12	P-500	PLUMBING DIAGRAMS		X		

UNION COUNTY ANNEX BUILDING

SHEET NO.	DRAWING NUMBER	DRAWING TITLE	DATE	ISSUE	ISSUED FOR BIDDING	
			07/28/2021			
		PLUMBING				
1	PA-001	PLUMBING LEAD SHEET		X		
2	PA-100	PLUMBING BASEMENT FLOOR PLAN		X		
3	PA-101	PLUMBING FIRST FLOOR PLAN		X		
4	PA-102	PLUMBING SECOND THRU FOURTH FLOOR PLAN		X		
5	PA-103	PLUMBING FIFTH FLOOR PLAN		X		
6	PA-104	PLUMBING PENTHOUSE FLOOR PLAN		X		
7	PA-200	PLUMBING RISER DIAGRAM		X		
8	PA-300	PLUMBING DETAILS		X		

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING LEAD SHEET

PROJECT TITLE:

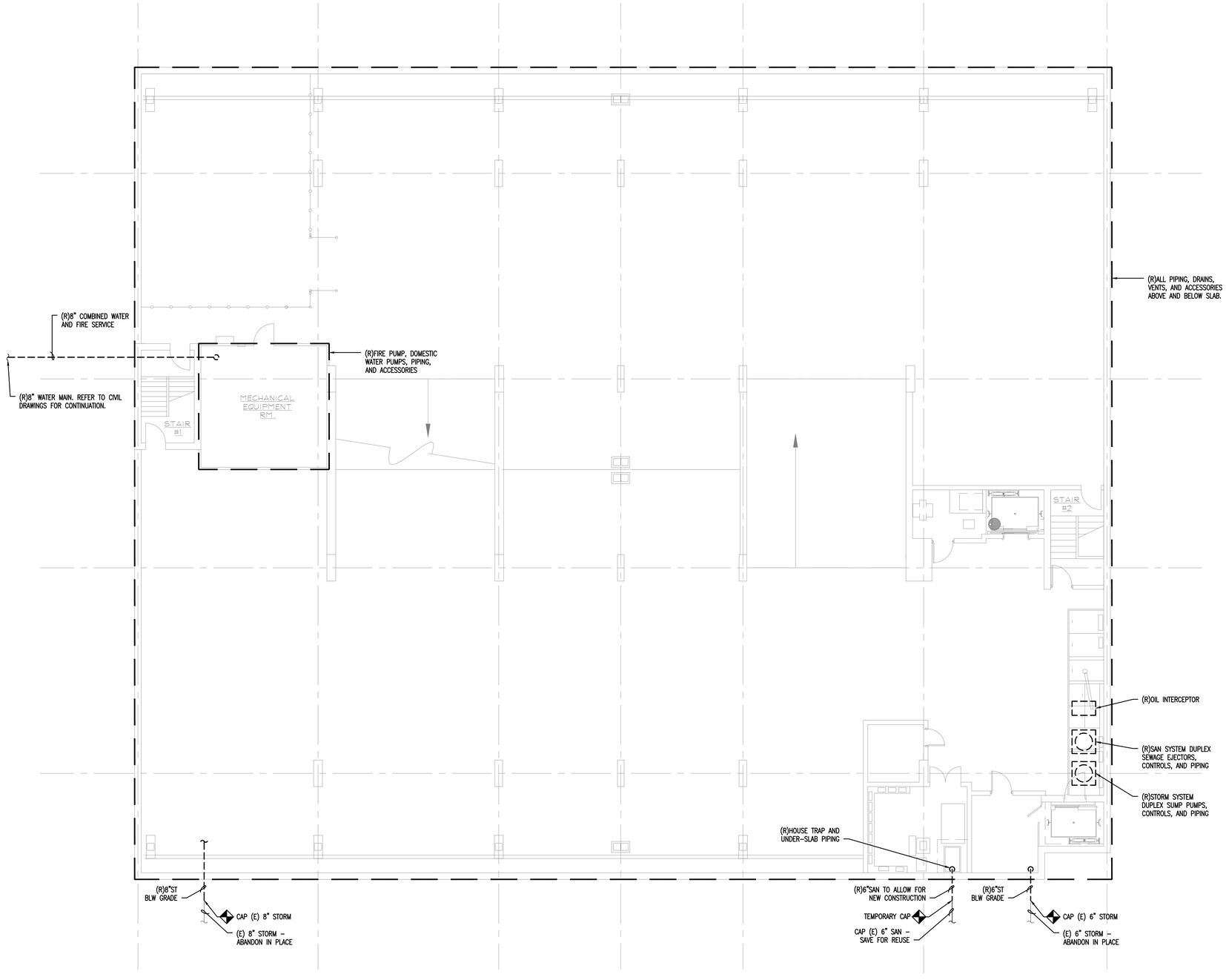
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P-001

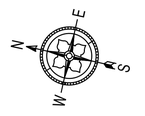


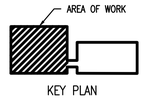
1 PD-100 **PLUMBING - EXISTING GARAGE BASEMENT DEMOLITION PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"

DEMOLITION NOTES:

1. GENERAL NOTES:
   - A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.
   - B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.
   - C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.
   - D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.
   - E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.
   - F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.
   - G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.
2. PLUMBING DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL FIXTURES, PIPING, EQUIPMENT, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE. ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.
   - C. FIRE PROTECTION DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL PIPING, VALVES, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE. ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.





KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING - EXISTING GARAGE BASEMENT DEMOLITION PLAN

PROJECT TITLE:

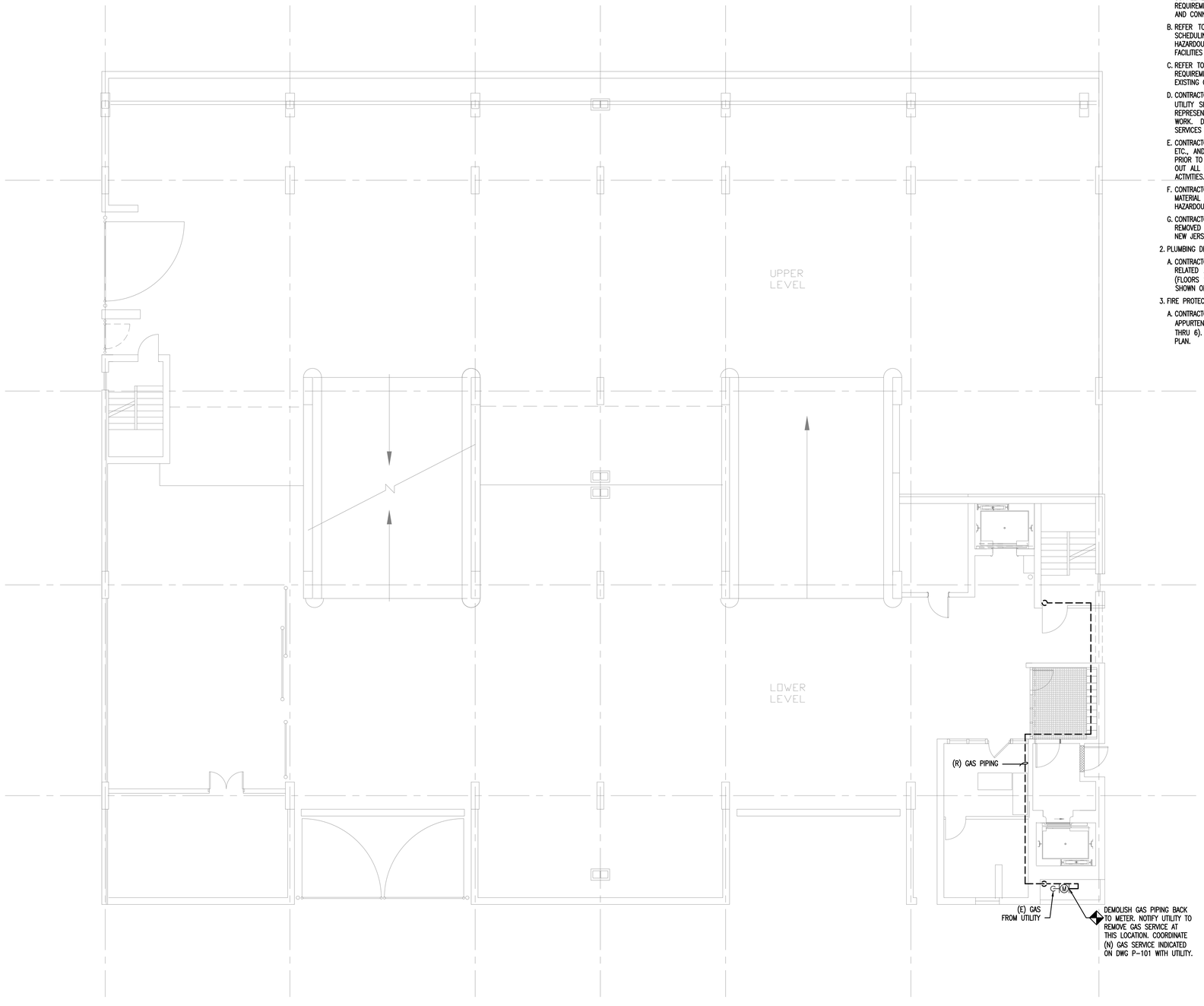
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
PD-100

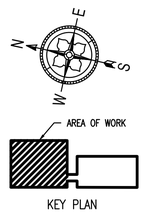


DEMOLITION NOTES:

1. GENERAL NOTES:
   - A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.
   - B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.
   - C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.
   - D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.
   - E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.
   - F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.
   - G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.
2. PLUMBING DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL FIXTURES, PIPING, EQUIPMENT, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE (FLOORS 1 THRU 6). ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.
3. FIRE PROTECTION DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL PIPING, VALVES, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE (FLOORS 1 THRU 6). ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.

1 / PD-101 PLUMBING – EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING - EXISTING GARAGE FIRST FLOOR DEMOLITION PLAN

PROJECT TITLE:

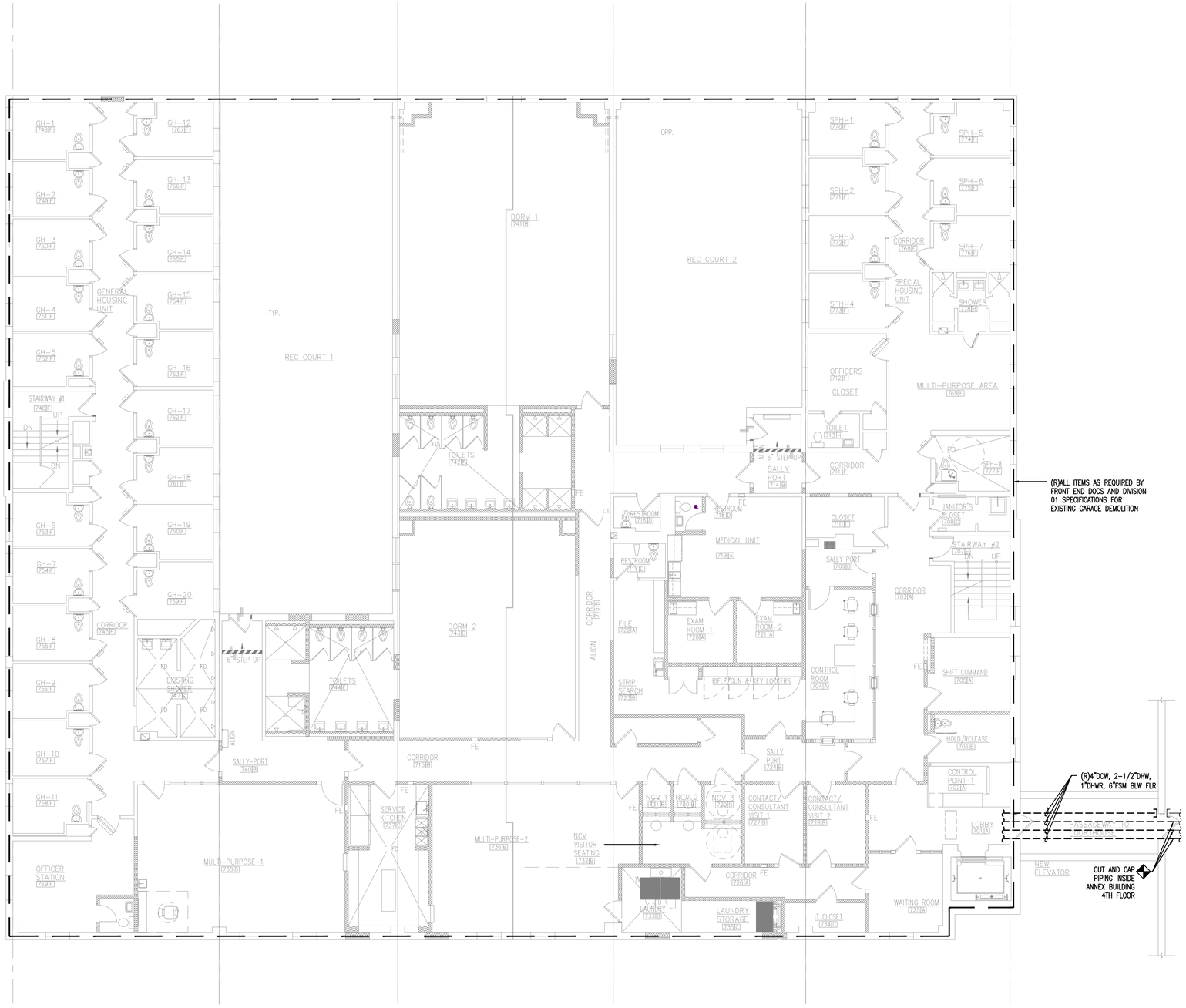
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
PD-101

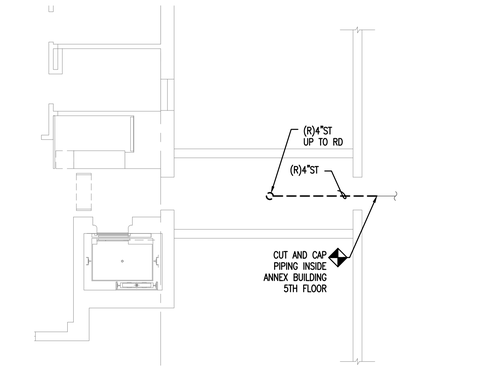


1 PD-102 PLUMBING – EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN

SCALE: 1/8"=1'-0"

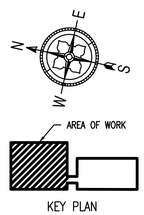
0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



2 PD-102 PLUMBING – EXISTING CONNECTOR BRIDGE PARTIAL ROOF DEMOLITION PLAN

SCALE: 1/8"=1'-0"



KEY PLAN

DEMOLITION NOTES:

1. GENERAL NOTES:
   - A. REFER TO FRONT END DOCUMENTS, DIVISION 01 SPECIFICATIONS AND SUPPLEMENTAL REQUIREMENTS OF THE CONTRACT FOR ALL APPLICABLE REQUIREMENTS AS IT PERTAINS TO THE DEMOLITION OF THE EXISTING GARAGE AND CONNECTING BRIDGE.
   - B. REFER TO DIVISION 01 SPECIFICATIONS FOR SUMMARY OF WORK, PROJECT SCHEDULING REQUIREMENTS INCLUDING PHASING OF DEMOLITION AND HAZARDOUS MATERIAL REMOVAL, PROTECTION REQUIREMENTS, TEMPORARY FACILITIES AND OTHER GENERAL REQUIREMENTS.
   - C. REFER TO PROJECT MANUAL INCLUDING RESPECTIVE TECHNICAL SECTIONS FOR REQUIREMENTS AS THEY PERTAIN TO THE DEMOLITION ACTIVITIES OF THE EXISTING GARAGE AND ANNEX BRIDGE.
   - D. CONTRACTOR SHALL COORDINATE, SCHEDULE AND GAIN APPROVAL FOR ALL UTILITY SHUTDOWNS AND SYSTEM DRAINING WITH THE OWNER, THE OWNER'S REPRESENTATIVE AND THE RESPECTIVE UTILITY COMPANY PRIOR TO COMMENCING WORK. DEMOLITION ACTIVITIES SHALL NOT DISRUPT ADJACENT PROPERTY UTILITY SERVICES UNLESS AUTHORIZED IN WRITING BY THE OWNER.
   - E. CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES, EQUIPMENT, PIPING SYSTEMS, ETC., AND THEIR POINTS OF ENTRANCE AND EXIT OF THE EXISTING GARAGE PRIOR TO DEMOLITION ACTIVITIES. CONTRACTOR SHALL FIELD VERIFY AND MARK OUT ALL POINTS OF ISOLATION AND TAG ACCORDINGLY PRIOR TO DEMOLITION ACTIVITIES.
   - F. CONTRACTOR SHALL NOT COMMENCE DEMOLITION ACTIVITIES UNTIL HAZARDOUS MATERIAL REMEDIATION HAS BEEN COMPLETED AND VERIFIED COMPLETE BY THE HAZARDOUS MATERIALS PROFESSIONAL.
   - G. CONTRACTOR SHALL BE RESPONSIBLE TO PROPERLY DISPOSE OR RECYCLE ALL REMOVED EQUIPMENT, REFRIGERANTS, BALLASTS, ETC., IN ACCORDANCE WITH NEW JERSEY ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS.
2. PLUMBING DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL FIXTURES, PIPING, EQUIPMENT, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE. ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.
3. FIRE PROTECTION DEMOLITION – SCOPE OF WORK:
   - A. CONTRACTOR SHALL DEMOLISH ALL PIPING, VALVES, AND ALL RELATED APPURTENANCES WITHIN THE EXISTING TO BE DEMOLISHED GARAGE. ONLY MAJOR EQUIPMENT AND CONNECTIONS TO SITE ARE SHOWN ON PLAN.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING - EXISTING GARAGE SEVENTH FLOOR DEMOLITION PLAN

PROJECT TITLE:

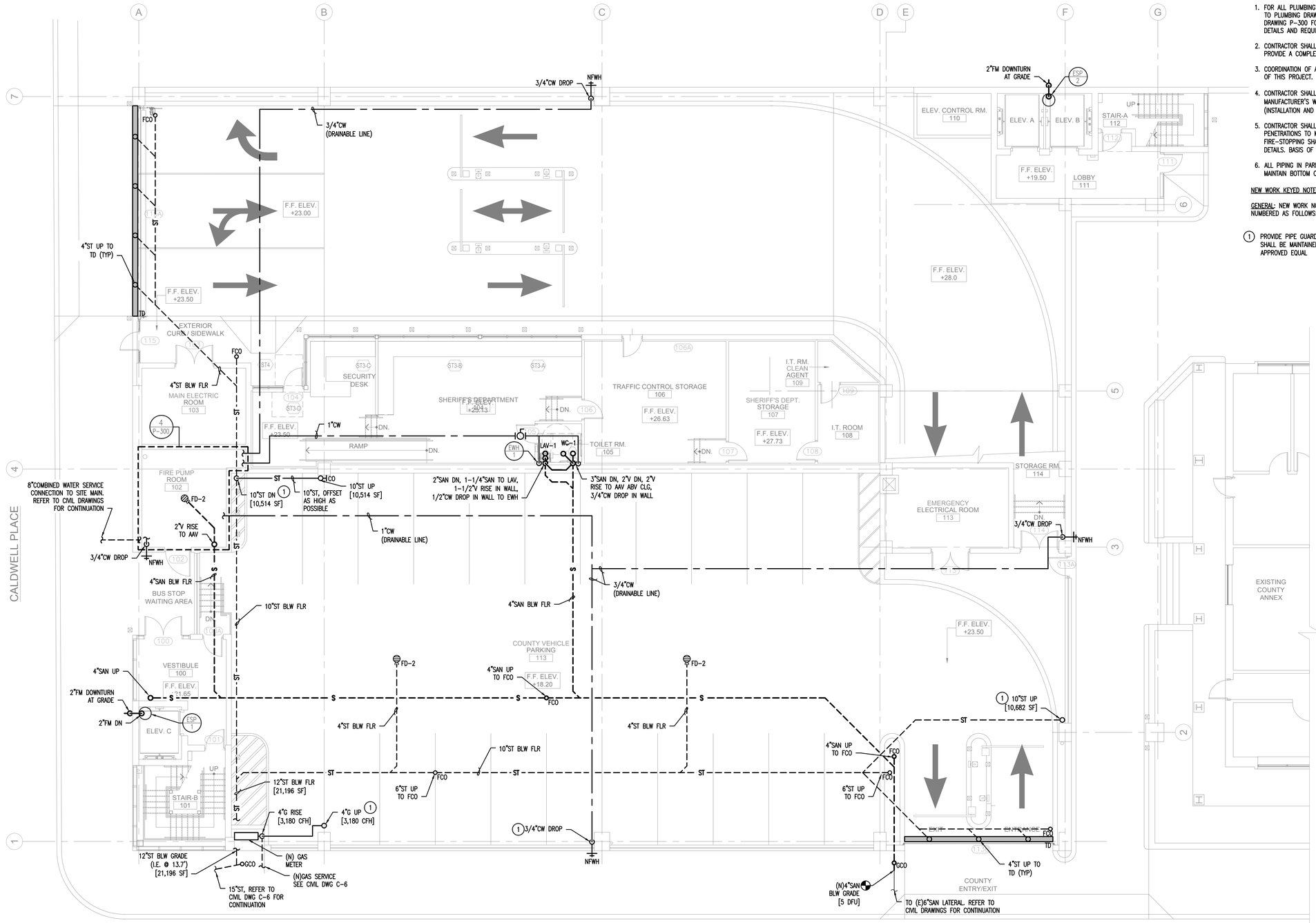
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
PD–102



ELIZABETHTOWN PLAZA

1 P-101 PLUMBING – NEW GARAGE FIRST FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

GENERAL NOTES:

1. FOR ALL PLUMBING WORK THAT PERTAINS TO THE SCOPE OF THIS PROJECT; REFER TO PLUMBING DRAWING P-001 FOR NOTES, ABBREVIATIONS AND LEGEND. REFER TO DRAWING P-300 FOR EQUIPMENT SCHEDULES AND DRAWING P-400 FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.
3. COORDINATION OF ALL PLUMBING WORK WITH ALL OTHER TRADES IS A REQUIREMENT OF THIS PROJECT.
4. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
5. CONTRACTOR SHALL PROVIDE FIRE-STOPPING AT ALL WALL, CEILING & FLOOR PENETRATIONS TO MEET UL RATING OF CONSTRUCTION PASSING THROUGH. FIRE-STOPPING SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS AND DETAILS. BASIS OF DESIGN: HILTI OR APPROVED EQUAL.
6. ALL PIPING IN PARKING AREAS SHALL BE ROUTED AS HIGH AS POSSIBLE TO MAINTAIN BOTTOM OF PIPE MIN 1'-0" ABOVE GARAGE CLEARANCE HEIGHT.

NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (#) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE PIPE GUARD FOR PIPING WITHIN DRIVE AREAS. ACCESS TO BASE CLEANOUTS SHALL BE MAINTAINED. BASIS OF DESIGN: OMEGA INDUSTRIAL "PIPE GUARD" OR APPROVED EQUAL

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING -
NEW GARAGE
FIRST FLOOR PLAN

PROJECT TITLE:

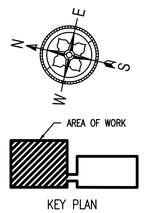
UNION COUNTY
PARKING GARAGE
BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

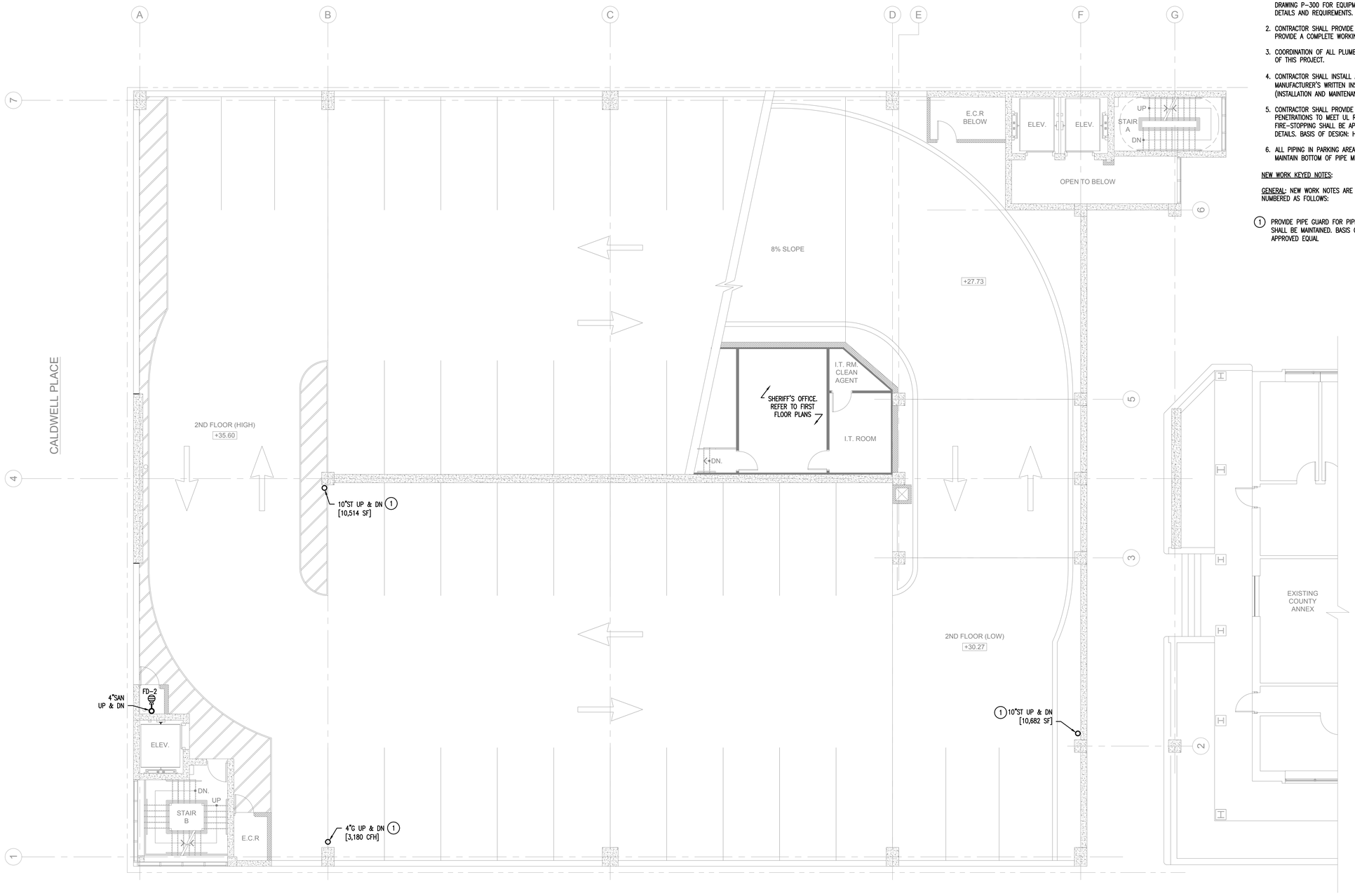
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P-101



KEY PLAN



ELIZABETHTOWN PLAZA

GENERAL NOTES:

1. FOR ALL PLUMBING WORK THAT PERTAINS TO THE SCOPE OF THIS PROJECT; REFER TO PLUMBING DRAWING P-001 FOR NOTES, ABBREVIATIONS AND LEGEND. REFER TO DRAWING P-300 FOR EQUIPMENT SCHEDULES AND DRAWING P-400 FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.
3. COORDINATION OF ALL PLUMBING WORK WITH ALL OTHER TRADES IS A REQUIREMENT OF THIS PROJECT.
4. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
5. CONTRACTOR SHALL PROVIDE FIRE-STOPPING AT ALL WALL, CEILING & FLOOR PENETRATIONS TO MEET UL RATING OF CONSTRUCTION PASSING THROUGH. FIRE-STOPPING SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS AND DETAILS. BASIS OF DESIGN: HILTI OR APPROVED EQUAL.
6. ALL PIPING IN PARKING AREAS SHALL BE ROUTED AS HIGH AS POSSIBLE TO MAINTAIN BOTTOM OF PIPE MIN 1'-0" ABOVE GARAGE CLEARANCE HEIGHT.

NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (#) AND ARE NUMBERED AS FOLLOWS:

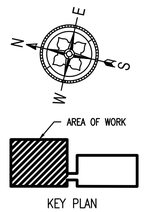
(1) PROVIDE PIPE GUARD FOR PIPING WITHIN DRIVE AREAS. ACCESS TO BASE CLEANOUTS SHALL BE MAINTAINED. BASIS OF DESIGN: OMEGA INDUSTRIAL "PIPE GUARD" OR APPROVED EQUAL

1 P-102 PLUMBING – NEW GARAGE SECOND FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING -
NEW GARAGE
SECOND FLOOR PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

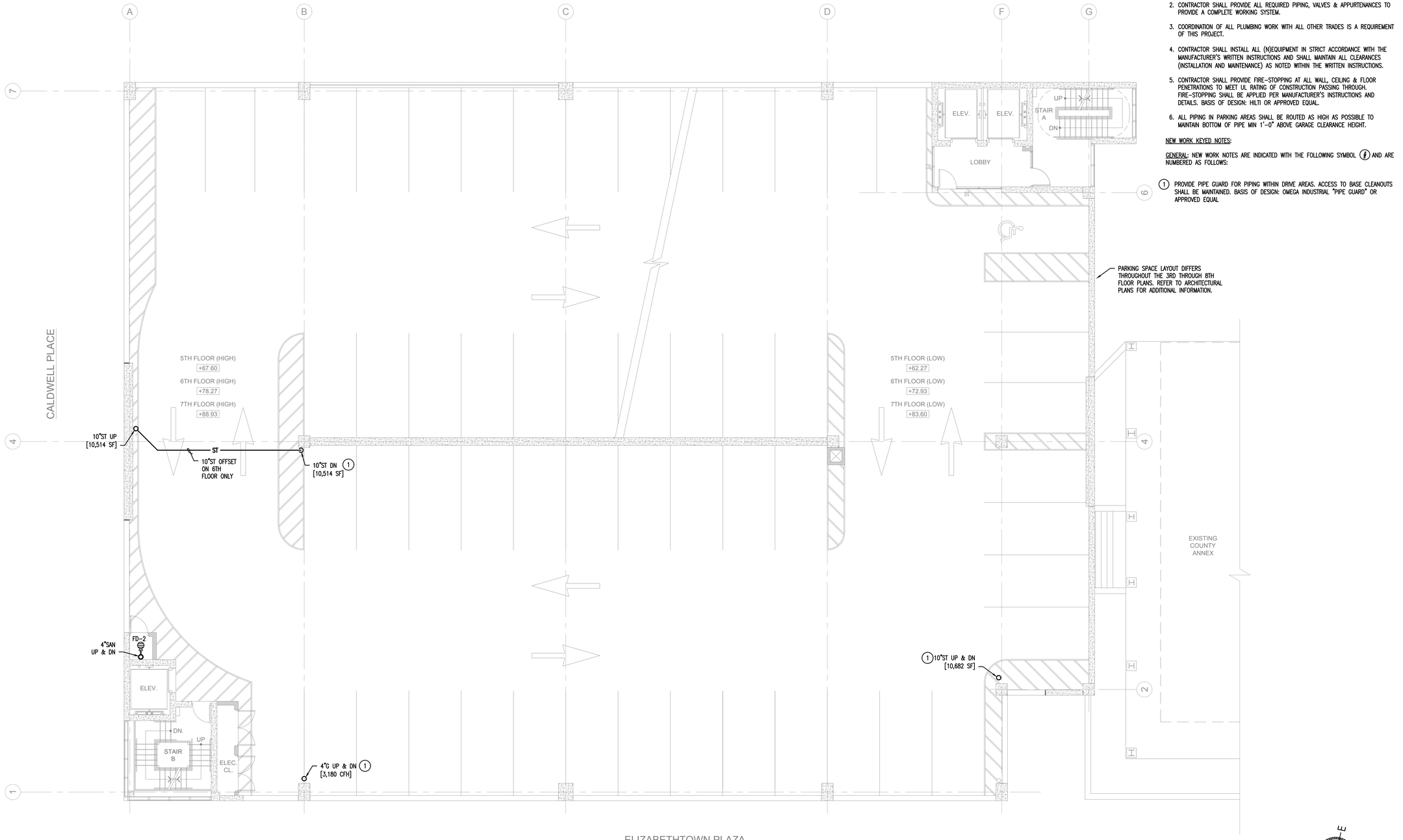
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

P-102



ELIZABETHTOWN PLAZA

GENERAL NOTES:

1. FOR ALL PLUMBING WORK THAT PERTAINS TO THE SCOPE OF THIS PROJECT; REFER TO PLUMBING DRAWING P-001 FOR NOTES, ABBREVIATIONS AND LEGEND. REFER TO DRAWING P-300 FOR EQUIPMENT SCHEDULES AND DRAWING P-400 FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.
3. COORDINATION OF ALL PLUMBING WORK WITH ALL OTHER TRADES IS A REQUIREMENT OF THIS PROJECT.
4. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
5. CONTRACTOR SHALL PROVIDE FIRE-STOPPING AT ALL WALL, CEILING & FLOOR PENETRATIONS TO MEET UL RATING OF CONSTRUCTION PASSING THROUGH. FIRE-STOPPING SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS AND DETAILS. BASIS OF DESIGN: HILTI OR APPROVED EQUAL.
6. ALL PIPING IN PARKING AREAS SHALL BE ROUTED AS HIGH AS POSSIBLE TO MAINTAIN BOTTOM OF PIPE MIN 1'-0" ABOVE GARAGE CLEARANCE HEIGHT.

NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (#) AND ARE NUMBERED AS FOLLOWS:

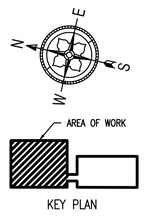
(1) PROVIDE PIPE GUARD FOR PIPING WITHIN DRIVE AREAS. ACCESS TO BASE CLEANOUTS SHALL BE MAINTAINED. BASIS OF DESIGN: OMEGA INDUSTRIAL "PIPE GUARD" OR APPROVED EQUAL

1 P-103 PLUMBING – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN

PROJECT TITLE:

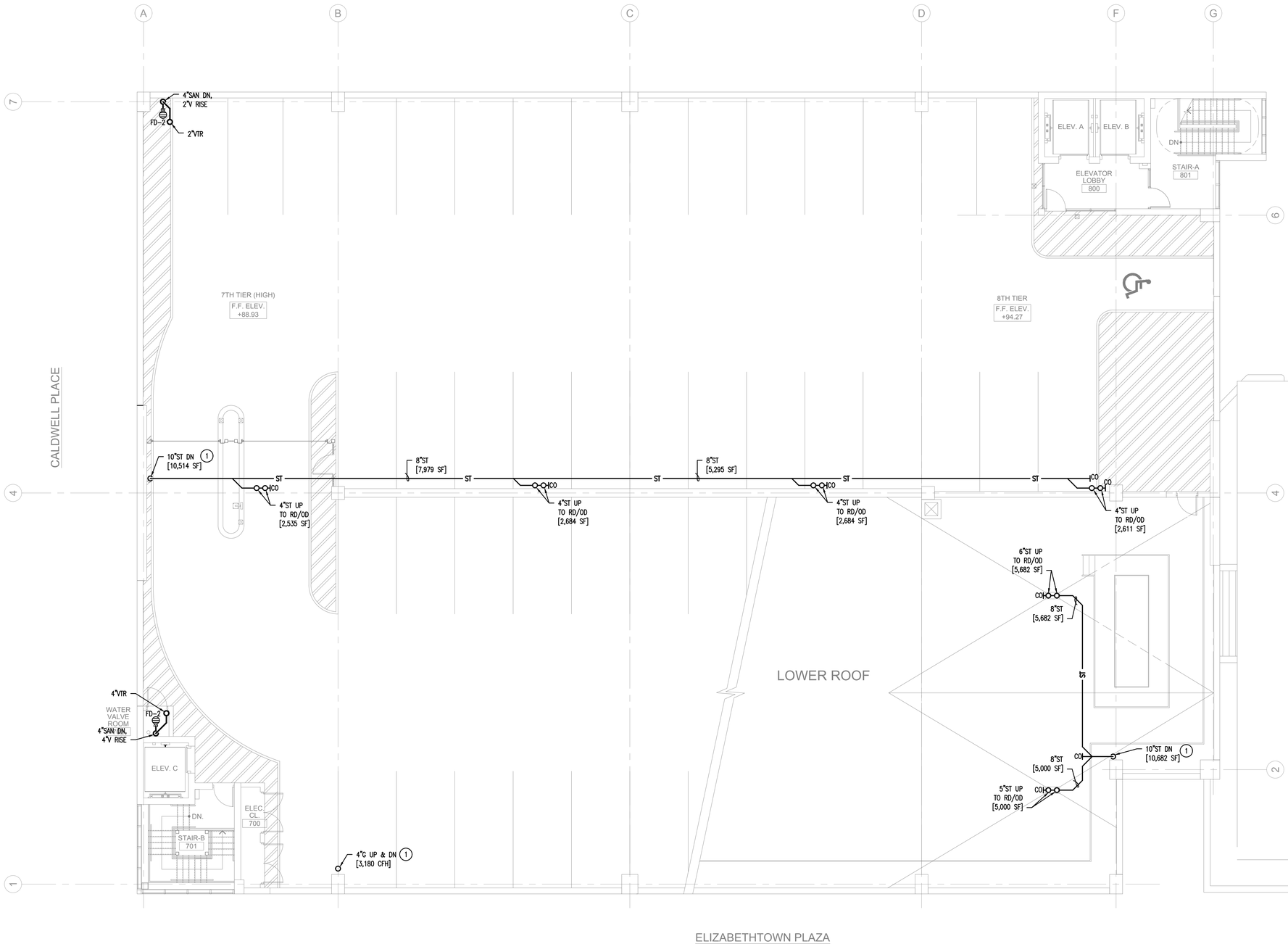
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

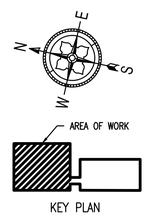
Drawing No.
P-103



1 P-104 **PLUMBING – NEW GARAGE EIGHTH FLOOR PLAN**

SCALE: 1/8"=1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')



KEY PLAN

GENERAL NOTES:

1. FOR ALL PLUMBING WORK THAT PERTAINS TO THE SCOPE OF THIS PROJECT; REFER TO PLUMBING DRAWING P-001 FOR NOTES, ABBREVIATIONS AND LEGEND. REFER TO DRAWING P-300 FOR EQUIPMENT SCHEDULES AND DRAWING P-400 FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.
3. COORDINATION OF ALL PLUMBING WORK WITH ALL OTHER TRADES IS A REQUIREMENT OF THIS PROJECT.
4. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
5. CONTRACTOR SHALL PROVIDE FIRE-STOPPING AT ALL WALL, CEILING & FLOOR PENETRATIONS TO MEET UL RATING OF CONSTRUCTION PASSING THROUGH. FIRE-STOPPING SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS AND DETAILS. BASIS OF DESIGN: HILTI OR APPROVED EQUAL.
6. ALL PIPING IN PARKING AREAS SHALL BE ROUTED AS HIGH AS POSSIBLE TO MAINTAIN BOTTOM OF PIPE MIN 1'-0" ABOVE GARAGE CLEARANCE HEIGHT.

NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (#) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE PIPE GUARD FOR PIPING WITHIN DRIVE AREAS. ACCESS TO BASE CLEANOUTS SHALL BE MAINTAINED. BASIS OF DESIGN: OMEGA INDUSTRIAL "PIPE GUARD" OR APPROVED EQUAL

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING -
NEW GARAGE
EIGHTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

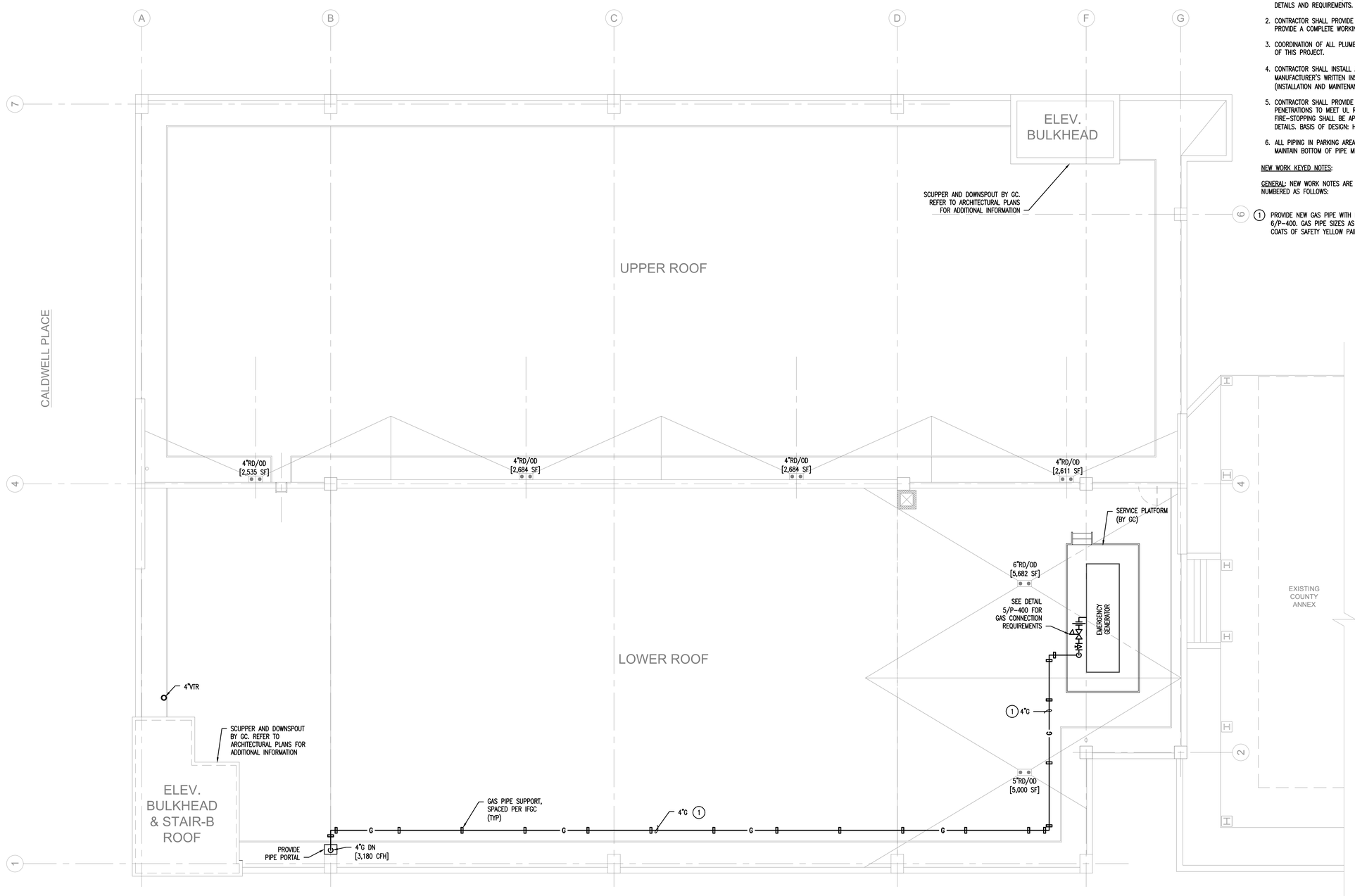
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

P-104



ELIZABETHTOWN PLAZA

1 / P-105 **PLUMBING – NEW GARAGE ROOF PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"

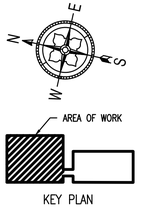
GENERAL NOTES:

1. FOR ALL PLUMBING WORK THAT PERTAINS TO THE SCOPE OF THIS PROJECT; REFER TO PLUMBING DRAWING P-001 FOR NOTES, ABBREVIATIONS AND LEGEND. REFER TO DRAWING P-300 FOR EQUIPMENT SCHEDULES AND DRAWING P-400 FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPING, VALVES & APPURTENANCES TO PROVIDE A COMPLETE WORKING SYSTEM.
3. COORDINATION OF ALL PLUMBING WORK WITH ALL OTHER TRADES IS A REQUIREMENT OF THIS PROJECT.
4. CONTRACTOR SHALL INSTALL ALL (N)EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES (INSTALLATION AND MAINTENANCE) AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.
5. CONTRACTOR SHALL PROVIDE FIRE-STOPPING AT ALL WALL, CEILING & FLOOR PENETRATIONS TO MEET UL RATING OF CONSTRUCTION PASSING THROUGH. FIRE-STOPPING SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS AND DETAILS. BASIS OF DESIGN: HILTI OR APPROVED EQUAL.
6. ALL PIPING IN PARKING AREAS SHALL BE ROUTED AS HIGH AS POSSIBLE TO MAINTAIN BOTTOM OF PIPE MIN 1'-0" ABOVE GARAGE CLEARANCE HEIGHT.

NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (#) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE NEW GAS PIPE WITH PIPE SUPPORTS ON ROOF IN ACCORDANCE WITH DETAIL 6/P-400. GAS PIPE SIZES AS INDICATED. GAS PIPING SHALL BE FINISHED WITH TWO COATS OF SAFETY YELLOW PAINT AND PRIMER SUITABLE FOR THE PIPE MATERIAL.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING -
NEW GARAGE
ROOF PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P-105

UNION COUNTY PARKING GARAGE PLUMBING FIXTURE SCHEDULE

TAG	FIXTURE	BASIS OF DESIGN MANUFACTURER AND MODEL	APPLICABLE STANDARD	MATERIAL	MOUNTING AND OUTLET	DIMENSIONS	RIM HEIGHT	FAUCETS, FITTINGS AND ACCESSORIES	NOTES
WC-1	FLOOR-MOUNTED ELONGATED WATER CLOSET MANUAL FLUSH	AMERICAN STANDARD CADET PRO 3517A.101	ASME A112.19.2	VITREOUS CHINA	FLOOR MOUNT BOTTOM OUTLET	28" X 18" X 30"	17"	1. SEAT: "PROFLO" OPEN FRONT, LESS COVER, COMMERCIAL GRADE W/CHECK HINGE. 2. CLOSET WAX RING: JOHNI-RING 90210.	
LAV-1	LAVATORY	AMERICAN STANDARD LUCERNE 0355.012	ASME A112.19.2M FAUCET ASME A112.18.1M	VITREOUS CHINA	WALL MOUNTED	21" X 18" X 12"	34"	1. FAUCET: AMERICAN STANDARD MODEL 6114.116.002 2. DRAIN: ZURN MODEL Z8746-PC OFFSET LAVATORY STRAINER, CHROME OPEN GRID STRAINER. 3. TRAP KEENEY 306CP CHROME PLATED BRASS P-TRAP W/CLEANOUT. 4. STOPS: BRASS CRAFT OCR19 R 1/2" X 3/8" COMPRESSION. 5. CONNECTORS: FLUIDMASTER 3/8" COMPRESSION X 1/2" FIP, NOMINAL LENGTH - 12". 6. ADA SKIRT: TRUEBRO LAV SHIELD. 7. CARRIER: JAY R. SMITH FIGURE 0710	FRONT OVERFLOW 0.5 GPM PRESSURE COMPENSATING OUTLET COLOR: WHITE
NFWH	NON-FREEZE HOSE BIB (EXTERIOR)	JAY R. SMITH FIGURE 5518	-	STAINLESS STEEL BRONZE	WALL MOUNTED	10" X 5"	-		
FD-1	FLOOR DRAIN	WATTS FD-910	-	CAST IRON	-	23" X 8"	-		
FD-2	FLOOR DRAIN	WATTS FD-100	-	CAST IRON	-	-	_		
TD-1	TRENCH DRAIN	WATTS DEAD LEVEL D	-	POLYPROPYLENE CAST IRON	-	LEANGTH AS SHOWN ON PLANS	_		PROVIDE WITH TRAFFIC RATED GRATE

PUMP SCHEDULE

(ESP-X)

SYMBOL	SERVICE	LOCATION	TYPE	GPM	HEAD (FT)	RPM	MOTOR HP	FLANGE SIZE (IN)	ELECTRICAL V/PH/HZ	OPER WEIGHT (LBS)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER
ESP-1	ELEVATOR SUMP PUMP	-	SUMP PUMP	50	20	3450	1/2	2	460/3/60	29	STANCOR	SE50
ESP-2	ELEVATOR SUMP PUMP	-	SUMP PUMP	100	12	3450	1	2	460/3/60	29	STANCOR	SE100

BACKFLOW PREVENTER SCHEDULE

(BFP-X)

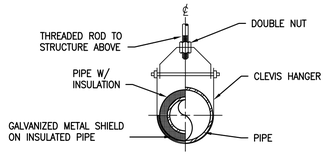
SYMBOL	SERVICE	LOCATION	TYPE	SIZE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
BFP-1	DOMESTIC WATER	FIRE PUMP ROOM	RPZ	2"	WATTS	LF009	PROVIDE WITH 909AGF AIR GAP FITTING.

INSTALL BACKFLOW PREVENTER BETWEEN 12" AND 60" ABOVE FINISHED FLOOR

ELECTRIC DOMESTIC WATER HEATER SCHEDULE

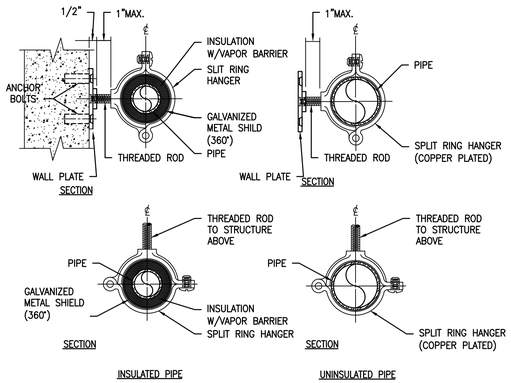
(EWH-X)

SYMBOL	LOCATION	TYPE	INPUT (KW)	TEMP. RISE (@ 0.5 GPM)	V/PH/HZ	FLA	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER
EWH-1	TOILET ROOM	INSTANTANEOUS	4	57	277/1/60	15.0	CHRONOMITE	CMI-15L/277



PIPE HANGER SCHEDULE

PIPE DIAMETER	SHIELD LENGTH	SHIELD THICKNESS	MAXIMUM PIPE SUPPORT SPACING: STEEL PIPE ROD DIA	STEEL PIPE SUPPORT SPACING	CAST IRON PIPE ROD DIA	CAST IRON PIPE SUPPORT SPACING	COPPER PIPE ROD DIA	COPPER PIPE SUPPORT SPACING
1/2"	12"	18 USSG	3/8"	5'-0"	—	——	3/8"	5'-0"
3/4"				6'-0"	—	——		5'-0"
1"				7'-0"	—	——		6'-0"
1-1/4"				8'-0"	—	——		7'-0"
1-1/2"				9'-0"	3/8"	5'-0"		8'-0"
2"				10'-0"	1/2"	5'-0"		8'-0"
2-1/2"			1/2"	11'-0"		5'-0"	1/2"	9'-0"
3"			1/2"	12'-0"		5'-0"		10'-0"
4"		14 USSG	5/8"			5'-0"		12'-0"
5"	18"		5/8"		5/8"	5'-0"		13'-0"
6"	18"		3/4"		3/4"	5'-0"	—	——
8"	18"		7/8"		7/8"	5'-0"	—	——



PIPE SUPPORT SCHEDULE

COPPER TUBING DIA.	ROD DIA.	SUPPORT SPACING	MAXIMUM RECOM. LOAD LBS.
1/2"	3/8"	5'-0"	180
3/4"	↓	5'-0"	↓
1"		6'-0"	
1 1/4"		7'-0"	
1 1/2"		8'-0"	
2"		8'-0"	
2 1/2"	1/2"	9'-0"	
3"	1/2"	10'-0"	180

1 P-300 **DETAIL & SCHEDULE – CLEVIS PIPE HANGER DETAIL**
NOT TO SCALE

2 P-300 **DETAIL & SCHEDULE – PIPE SUPPORT**
NOT TO SCALE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING SCHEDULES

PROJECT TITLE:

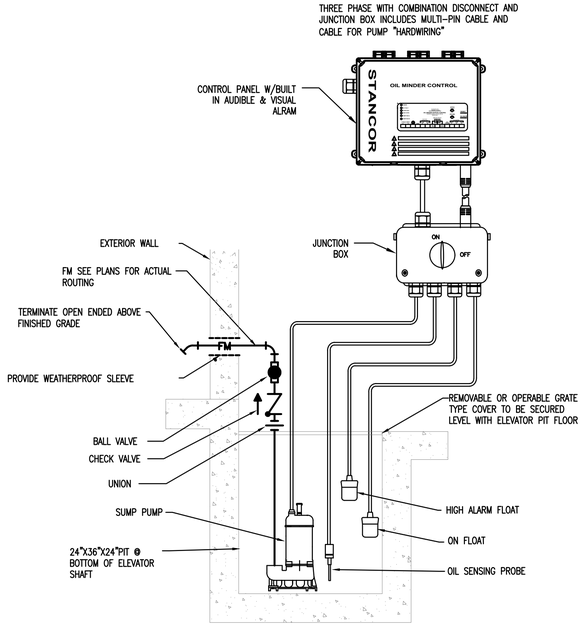
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

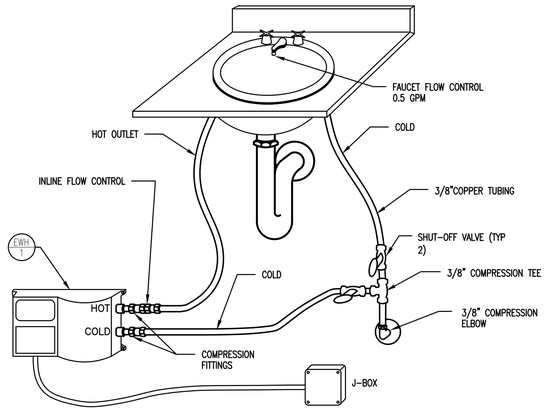
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P–300

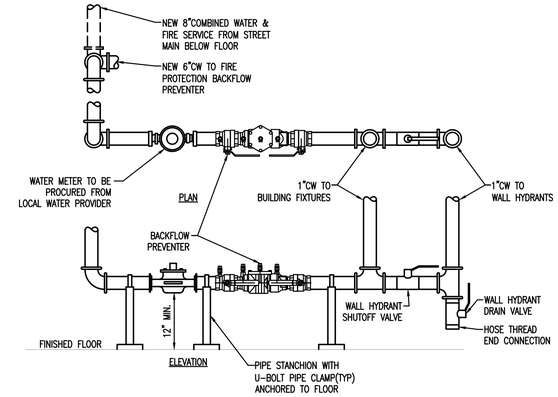


1 P-400 **DETAIL – ELEVATOR SUMP PUMP**
SCALE: NTS

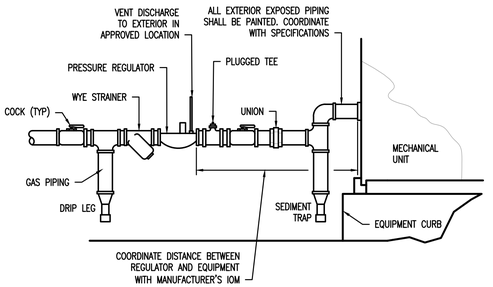


2 P-400 **DETAIL – LAVATORY WATER HEATER**
SCALE: NTS

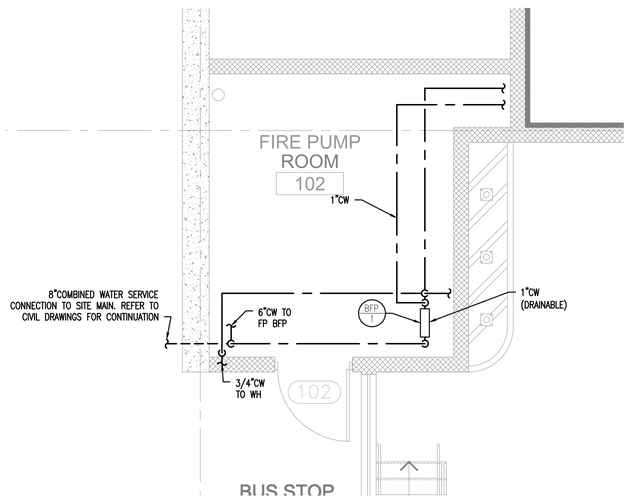
NOTE: FOR HANDICAPPED ACCESSIBLE LAVATORIES AND SINKS, MOUNT HOT WATER HEATER UNDER SINK IN A POSITION THAT WILL NOT INTERFERE WITH FORWARD APPROACH, KNEE OR TOE OBSTRUCTION IN ACCORDANCE WITH ICC/ANSI A117.1, SECTION 606. ALSO, PROVIDE INSULATION ON ALL PIPES BELOW SINK TO PROTECT AGAINST CONTACT.



3 P-400 **DETAIL – DOMESTIC WATER SERVICE**
SCALE: NTS

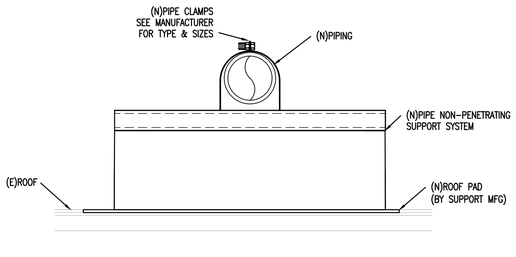


6 P-400 **DETAIL – GAS CONNECTION**
SCALE: NTS



4 P-400 **DETAIL – WATER ROOM ENLARGED PLAN**
SCALE: 1/4"=1'-0"

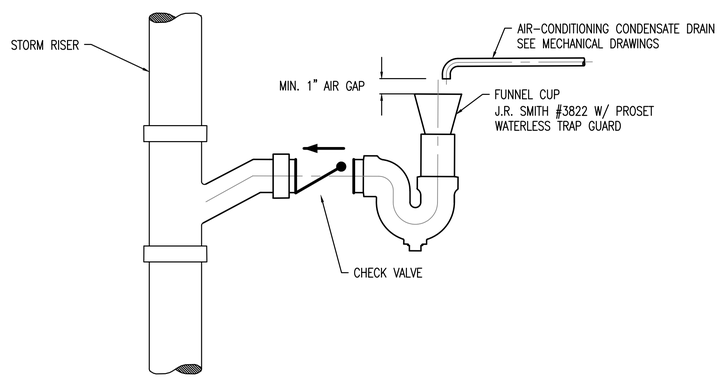
0' 1' 2' 4' 8'
SCALE BAR: 1/4"=1'-0"



5 P-400 **DETAIL – PIPE SUPPORT ON ROOF**
SCALE: N.T.S. (NON-PENETRABLE TYPE)

NOTES:

1. PROVIDE PEDESTAL MOUNTED SUPPORT SYSTEM AT INTERVALS AS DESIGNATED BY IFGC.
2. SUPPORT SYSTEM SHALL BE NON-PENETRATING TYPE. SPACING SHALL BE PER IFGC REQUIREMENTS AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. CHANNELS SHALL BE 12 GAUGE, HOT DIP GALVANIZED CARBON STEEL, 1" HIGH.
4. HARDWARE (NUT AND WASHERS) SHALL BE HOT DIP GALVANIZED CARBON STEEL.
5. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. PROVIDE HAYDON H-BLOCK-MEGA SERIES OR APPROVED EQUAL.



7 P-400 **HVAC CONDENSATE FUNNEL DRAIN DETAIL**
SCALE: N.T.S.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING DETAILS

PROJECT TITLE:

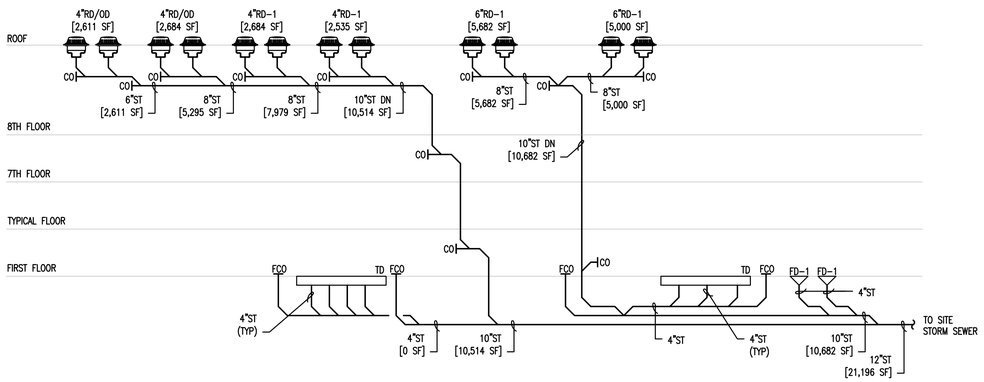
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

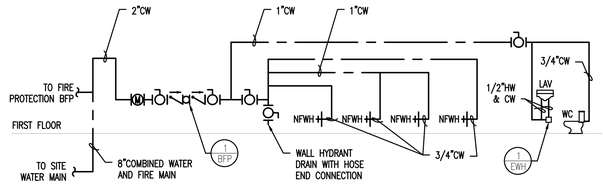
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P-400

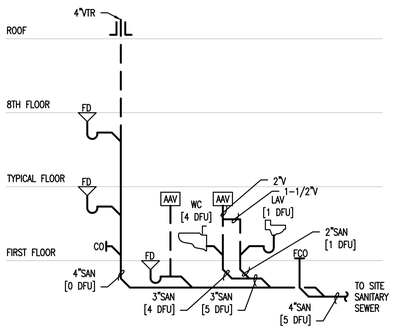


1 P-500 **RISER DIAGRAM – STORM DRAIN**
SCALE: NONE

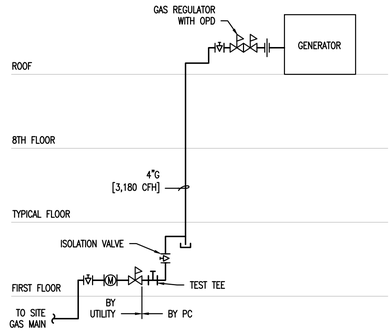


2 P-500 **RISER DIAGRAM – DOMESTIC WATER**
SCALE: NONE
NOTES:

1. PITCH ALL DRAINABLE WATER PIPING TOWARDS LOW POINT.



3 P-500 **RISER DIAGRAM – SANITARY**
SCALE: NONE



4 P-500 **RISER DIAGRAM – GAS**
SCALE: NONE
GAS NOTES:

1. GAS SYSTEM SIZED PER INTERNATIONAL FUEL GAS CODE 2018, EQUATION 4-1 OF SECTION 402.4(1) OF THE INTERNATIONAL FUEL & GAS CODE.
2. NEW GAS SERVICE TO DELIVER PROPOSED LOAD OF 3,180 CFH TOTAL @ 1 PSI AT OUTLET OF UTILITY REGULATOR AT METER OUTLET.
3. CONTRACTOR RESPONSIBLE TO COORDINATE A NEW GAS SERVICE WITH PSE&G AND OWNER.

GAS SYSTEM (1 PSI)
200 EQUIVALENT LF
LESS THAN 2 PSI, 0.3" PD, SG=0.60

PROPOSED GAS LOAD: 3,180 CFH

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING DIAGRAMS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
P-500

ABBREVIATIONS

ABV	ABOVE
ACCOM	ACCOMMODATE
AD	ACCESS DOOR
ATMOS	ATMOSPHERE
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATE
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARRG	ARRANGEMENT
ATP	AUTOMATIC TRAP PRIMER
BLDG	BUILDING
BLW	BELOW
BTU	BRITISH THERMAL UNIT
BV	BUTTERFLY VALVE
C	COMMON
CAB	CABINET
CAP	CAPACITY
CFH	CUBIC FEET PER HOUR
℄	CENTER LINE
CLG	CEILING
CO	CLEAN OUT
COL	COLUMN
CON	CONCENTRIC
CONC	CONCRETE
CD	CONDENSATE DRAIN
CONN	CONNECTION
CONT	CONTINUATION
CONTR	CONTRACTOR
CU	CUBIC
CW	COLD WATER
DEPT	DEPARTMENT
DFU	DRAINAGE FIXTURE UNIT
DIA	DIAMETER
DIAG	DIAGRAM
DISCH	DISCHARGE
DN	DOWN
DWG	DRAWING
(E)	EXISTING TO REMAIN
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRIC
ELEV	ELEVATOR
EQUIP	EQUIPMENT
EXPAN	EXPANSION
℉	DEGREES FAHRENHEIT
FAI	FRESH AIR INLET
FC	FLOOR CLEANOUT
FD	FLOOR DRAIN
FIN	FINISHED
FLR	FLOOR
FP	FIRE PROTECTION
G	GUIDE/S
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPD	GALLONS PER DAY
GCO	GRADE CLEANOUT
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H	HEIGHT
HB	HOSE BIBB
HD	HEAD
HP	HORSEPOWER
HR	HOUR
HTR	HEATER
HW	HOT WATER
HZ	HERTZ
ID	INTERNAL DIAMETER
IDW	INDIRECT WASTE
IN	INCHES
INV	INVERT
KW	KILOWATT
LVG	LEAVING
MAX	MAXIMUM
MBH	THOUSANDS OF BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MED	MEDIUM
MFR	MANUFACTURER
MIN	MINIMUM
MTD	MOUNTED
(N)	NEW
NIC	NOT IN CONTRACT
No	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OD	OVERFLOW DRAIN
PC	PLUMBING CONTRACTOR
PERF	PERFORATED
PEX	PEX PIPING
PEX-MF	PEX PIPING MANIFOLD
PH	PHASE
PRESS	PRESSURE
PSI	POUNDS PER SQUARE INCH
QUAN	QUANTITY
(R)	REMOVE EXISTING
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
(RE)	RELOCATE EXISTING
REQ	REQUIRED
RET	RETURN
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RWC	RAINWATER CONDUCTOR
SAN	SANITARY
SCH	SCHEDULE
SCHEM	SCHEMATIC
SFU	SUPPLY FIXTURE UNIT
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
SS	SERVICE SINK
ST.STL.	STAINLESS STEEL
ST	STORM
STL	STEEL
TEMP	TEMPERATURE
TP	TOTAL PRESSURE
TYP	TYPICAL
V	VENT
VCO	VERTICAL CLEANOUT
VEL	VELOCITY
VOLT	VOLTAGE
VTR	VENT THRU ROOF
W	WIDTH
W/	WITH/WIDE
W/O	WITHOUT
WC	WATER COLUMN
WCO	WALL CLEANOUT
WG	WATER GAUGE

HANGERS & SUPPORTS

1. HANGERS AND ANCHORS SHALL BE SECURELY ATTACHED TO BUILDING CONSTRUCTION AT SUFFICIENTLY CLOSE INTERVALS TO SUPPORT PIPING AND ITS CONTENTS.
   A. VERTICAL PIPING FOR CAST IRON SHALL BE SUPPORT AT BASE AND AT EACH STORY HEIGHT.
   B. VERTICAL PIPING FOR COPPER SHALL BE SUPPORTED AT EACH STORY HEIGHT BUT NOT MORE THAN 10 FOOT INTERVALS.
   C. HORIZONTAL PIPING FOR COPPER SHALL BE SUPPORTED AT 6 FOOT INTERVALS FOR PIPE SIZES 1-1/4" AND SMALL AND AT 10 FOOT INTERVALS FOR PIPE SIZES 1-1/2" AND LARGER. WHERE PIPE IS SUSPENDED BY NON-RIGID HANGERS MORE THAN 18" LONG, PROVIDE LATERAL SUPPORT.
2. ALL SUPPORTS IN CONTACT WITH COPPER PIPING SHALL BE PLASTIC COATED.
3. INSTALL METAL SHIELDS ON HANGERS SUPPORTING INSULATED PIPE.
4. ALL DOMESTIC WATER AND SANITARY WASTE PIPE SUPPORTS SHALL BE IN ACCORDANCE WITH NSPC CHAPTER 8 MSS SP-58, 69 & 89.
5. PLUMBING SYSTEMS SHALL BE INSTALLED SO AS TO PREVENT STRAINS & STRESS WHICH WILL EXCEED STRUCTURAL STRENGTH OF PIPE. PROVISIONS SHALL BE MADE FOR EXPANSION & CONTRACTION OF PIPING.
6. HANGERS, ANCHORS, AND SUPPORTS SHALL BE OF METAL. OTHER MATERIAL OF SUFFICIENT STRENGTH TO SUPPORT THE PIPING AND ITS CONTENTS IS ACCEPTABLE. ALL SUPPORTS AND FASTENERS LOCATED OUTSIDE OR IN CORROSIVE AREAS SHALL BE GALVANIZED.
7. MINIMUM ROD DIAMETER FOR SINGLE RIGID SUPPORTS SHALL BE AS FOLLOW:
   FOR 1-1/4" THRU 2" PIPE: 3/8" DIAMETER
   FOR 2-1/2" AND 3" PIPE: 1/2" DIAMETER
   FOR 4" AND 5" PIPE: 5/8" DIAMETER
   FOR 6" PIPE: 3/4" DIAMETER
   FOR 8" PIPE: 7/8" DIAMETER
   FOR 14" THRU 18" PIPE: 1" DIAMETER
   RODS MAY BE REDUCED ONE SIZE FOR DOUBLE ROD HANGERS (3/8" DIA. MIN.)

AVAILABLE WATER PRESSURE DATA

NJAWC HYDRANT TEST #5561
DATE: 06/26/2020
FLOW STREET: RAHWAY AVENUE
FLOW HYDRANT #: 27190
STATIC PRESSURE: 55 PSI
RESIDUAL PRESSURE: 50 PSI
FLOW: 1126 GPM

LINE DESIGNATIONS

- VENT LINE
- DOMESTIC COLD WATER
- DOMESTIC HOT WATER – 110°F
- DOMESTIC HOT WATER RECIRCULATING
- 140°F — DOMESTIC HOT WATER – 140°F
- DIRECTION OF FLOW ARROW
- ST — STORM LINE (ABOVE SLAB/ABOVE FIN. CLG.)
- SAN — SANITARY LINE (ABOVE SLAB/ABOVE FIN. CLG.)
- ST — STORM LINE (BELOW SLAB)
- SAN — SANITARY LINE (BELOW SLAB)
- GW — GREASE WASTE (BELOW SLAB)

PLUMBING SYMBOLS

- WHA — WATER HAMMER ARRESTER
- NFWH — WALL HYDRANT (NON-FREEZE)
- FD — FLOOR DRAIN
- FLOOR / WALL / FCO / CO / WCO — CLEANOUT
- CAP
- CHECK VALVE
- BALANCING VALVE
- GAS COCK
- THERMOSTATIC MIXING VALVE
- TP — TEMPERATURE & PRESSURE RELIEF VALVE
- STRAINER
- PIPE RISING UP
- PIPE DROPPING DOWN
- UNION
- THERMOMETER
- GA — GAUGE WITH GAUGE COCK & SNUBBER (WATER)
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- RPZ/BACKFLOW PREVENTER

MISC. DWG. SYMBOLS

- POINT OF CONNECTION
- POINT OF DISCONNECT
- POINT OF CONNECTION FOR FUTURE WORK
- EQUIPMENT SYMBOL
- EQUIPMENT NUMBER OR FLOW (GPM,CFM,ETC.)
- DETAIL NUMBER
- DETAIL DRAWING NUMBER
- SECTION LETTER
- SECTION DRAWING NUMBER
- PLAN NUMBER
- PLAN DRAWING NUMBER
- KEYED DEMOLITION NOTE
- KEYED NEW WORK NOTE

NOTES

THE FOLLOWING NOTES APPLY TO ALL "P" PLUMBING DRAWINGS:

1. THE ENTIRE PLUMBING INSTALLATION SHALL CONFORM TO THE NATIONAL STANDARD PLUMBING CODE 2018 EDITION ,INTERNATIONAL FUEL GAS CODE "2018" EDITION, 2018 FGI GUIDELINES AND LOCAL AUTHORITIES HAVING JURISDICTION AND THE CITY OF ELIZABETH, NJ. NOTIFY CITY BUILDING CODE ENFORCEMENT FOR ALL REQUIRED INSPECTIONS.
2. PRIOR TO STARTING CONSTRUCTION, DETERMINE EXACT INVERT ELEVATION, SIZE, DEPTH AND LOCATION OF NEW UTILITIES WHERE CONNECTIONS ARE TO BE MADE OR INTERSECTIONS OCCUR. NOTIFY ARCHITECT OR ENGINEER OF ANY DISCREPANCY BETWEEN DRAWINGS AND ACTUAL FIELD CONDITIONS. WORK BACK TOWARD BUILDING FROM UTILITY CONNECTION FOR ALL PIPING SYSTEMS.
3. VERIFY WITH OWNER, PRIOR TO STARTING CONSTRUCTION, THE LOCATION OF ALL ON-SITE UNDERGROUND UTILITIES THAT WILL BE AFFECTED BY THIS WORK.
4. INSTALL ALL WATER HAMMER ARRESTORS IN ACCORDANCE WITH THE LATEST "PLUMBING AND DRAINAGE INSTITUTE STANDARDS" FOR WATER HAMMER ARRESTORS.
5. PROVIDE AND LOCATE ACCESS PANELS IN NON ACCESSIBLE CEILINGS AND WALLS FOR ALL VALVES, WATER HAMMER ARRESTORS, CLEANOUTS AND ALL OTHER ITEMS THAT REQUIRE ACCESS TO PROPERLY MAINTAIN OR SERVICE THE BUILDING.
6. COORDINATE PLUMBING WORK WITH ALL OTHER TRADES FOR CLEARANCES, ACCESS AND STRUCTURAL INTERFERENCES PRIOR TO INSTALLATION OF ANY SYSTEMS.
7. DOMESTIC WATER PIPE FOR ABOVE GROUND USE SHALL BE ASTM B88 TYPE "L" SEAMLESS COPPER TUBE WITH SOLDER JOINT FITTINGS USING 95-5 SOLDER PER ASTM B32. ALL WATER SERVICE PIPING SHALL BE WATER RATED FOR NOT LESS THAN 200 PSI @ 73°F. ALL WATER DISTRIBUTION PIPING SHALL BE WATER RATED FOR NOT LESS THAN 100 PSI @ 180°F.
8. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. ROUTING IS DIAGRAMMATIC AND APPROXIMATE. ALL REQUIRED OFFSETS, RISE AND DROPS ARE NOT NECCESSARILY SHOWN. SUBMISSION BY THE PLUMBING CONTRACTOR SHALL BE CONSTRUED AS EVIDENCE THAT THE P.C. HAS INCLUDED IN HIS OR HER BID PRICE, INSTALLATION OF ALL PLUMBING SYSTEMS COORDINATED WITH G.C. AND ALL TRADES.
9. DOMESTIC WATER PIPING SHALL BE FLUSHED WITH WATER UNTIL NO DIRTY WATER APPEARS AT THE POINTS OF OUTLETS.
10. POTABLE WATER PIPING SHALL BE DISINFECTED PRIOR TO USE PER NATIONAL STANDARD PLUMBING CODE. THE PIPING SHALL BE FILLED WITH A WATER CHLORINE SOLUTION CONTAINING AT LEAST 50 PARTS PER MILLION OF CHLORINE AND SHALL BE VALVED OFF FOR 24 HOURS OR FILLED WITH A WATER CHLORINE SOLUTION CONTAINING AT LEAST 200 PARTS PER MILLION OF CHLORINE AND ALLOWED TO STAND FOR AT LEAST 3 HOURS. FOLLOWING THE ALLOWED STANDING TIME, THE SYSTEM SHALL BE FLUSHED WITH POTABLE WATER UNTIL NO CHLORINE REMAINS IN THE SYSTEM. PROVIDE RESULTS OF DISINFECTION TO OWNER WHEN COMPLETE. STERILIZATION WORK SHALL COMPLY WITH NSPC 2015 SECTION 10.9.2, PARAGRAPH A1 TO A9.
11. DOMESTIC WATER PIPE SHALL CONSIST A HYDROSTATIC PRESSURE TEST OF 25 PSIG ABOVE THE WORKING PRESSURE UNDER WHICH IT IS OPERATED FOR NOT LESS THAN 60 MIN.
12. IF LEAKS OCCUR DURING TESTING, REPAIRS SHALL BE MADE AND SYSTEM RETESTED UNTIL NO EVIDENCE OF LEAKS EXIST FOR THE DUREATION OF THE TEST.
13. DOMESTIC WATER PIPE SHALL BE INSULATED WITH 1" THICK FIBERGLASS PREFORMED INSULATION WITH VAPOR JACKET AND SELF SEALING TAPE, EQUAL TO OWENS-CORNING ASJ/SSL-2. PIPING IN EXTERIOR WALLS SHALL HAVE 2" THICK INSULATION. DOMESTIC WATER PIPE MAY BE INSULATED WITH AP/ARMAFLEX SS (SELFSEAL) FLEXIBLE ELASTOMERIC THERMAL INSULATION, 1/2" THICKNESS, OR APPROVED EQUAL. PIPING IN EXTERIOR WALLS SHALL HAVE 1" THICK INSULATION.

PLUMBING DEMOLITION NOTES

1. EXISTING SERVICES INDICATED ON THESE DRAWINGS WERE DERIVED FROM EXISTING DRAWINGS AND LIMITED FIELD OBSERVATIONS. THESE DRAWINGS MAY NOT BE INCLUSIVE OF SERVICES THAT EXIST IN THE PROJECT AREA. CONTRACTOR SHALL VERIFY SERVICES, LOCATION, TYPE, AND SIZE PRIOR TO ANY CONSTRUCTION. DEVIATIONS IMPACTING WORK SHOWN ON THESE DOCUMENTS SHALL BE REPORTED TO THE ARCHITECT FOR COORDINATION PRIOR TO CONSTRUCTION.
2. EXISTING SERVICES, EQUIPMENT, AND FIXTURES TO REMAIN OR TO BE RELOCATED SHALL BE REPAIRED TO ORIGINAL OPERATION OR REPLACED, SHOULD THEY BE DAMAGED DURING CONSTRUCTION.
3. ALL EXISTING WORK NOT SHOWN ON THESE DRAWINGS (UNLESS NOTED OTHERWISE) SHALL REMAIN AS IS.
4. ALL PENETRATIONS OR OPENINGS FROM REMOVED PIPES THROUGH EXISTING BUILDING WALLS AND FLOORS SHALL BE SLEEVED AND/OR PATCHED TO MATCH ORIGINAL. SEE ARCHITECTURAL DRAWINGS FOR FINAL FINISHES.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING PIPING, FIXTURES, MED GAS OUTLETS OR EQUIPMENT DUE TO NEW CONSTRUCTION AND SHALL RESTORE EXISTING WORK TO ITS ORIGINAL CONDITION AT NO COST TO THE OWNER.
6. CONTINUITY OF SERVICES: EXISTING BUILDING WILL REMAIN IN USE DURING CONSTRUCTION OPERATIONS. WHEN AN INTERRUPTION OF AN EXISTING SERVICE IS NECESSARY, CONTRACTOR SHALL COORDINATE WITH AUTHORIZED HOSPITAL PERSONNEL BEFORE MAKING THE NECESSARY INTERRUPTION.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING LEAD SHEET

PROJECT TITLE:

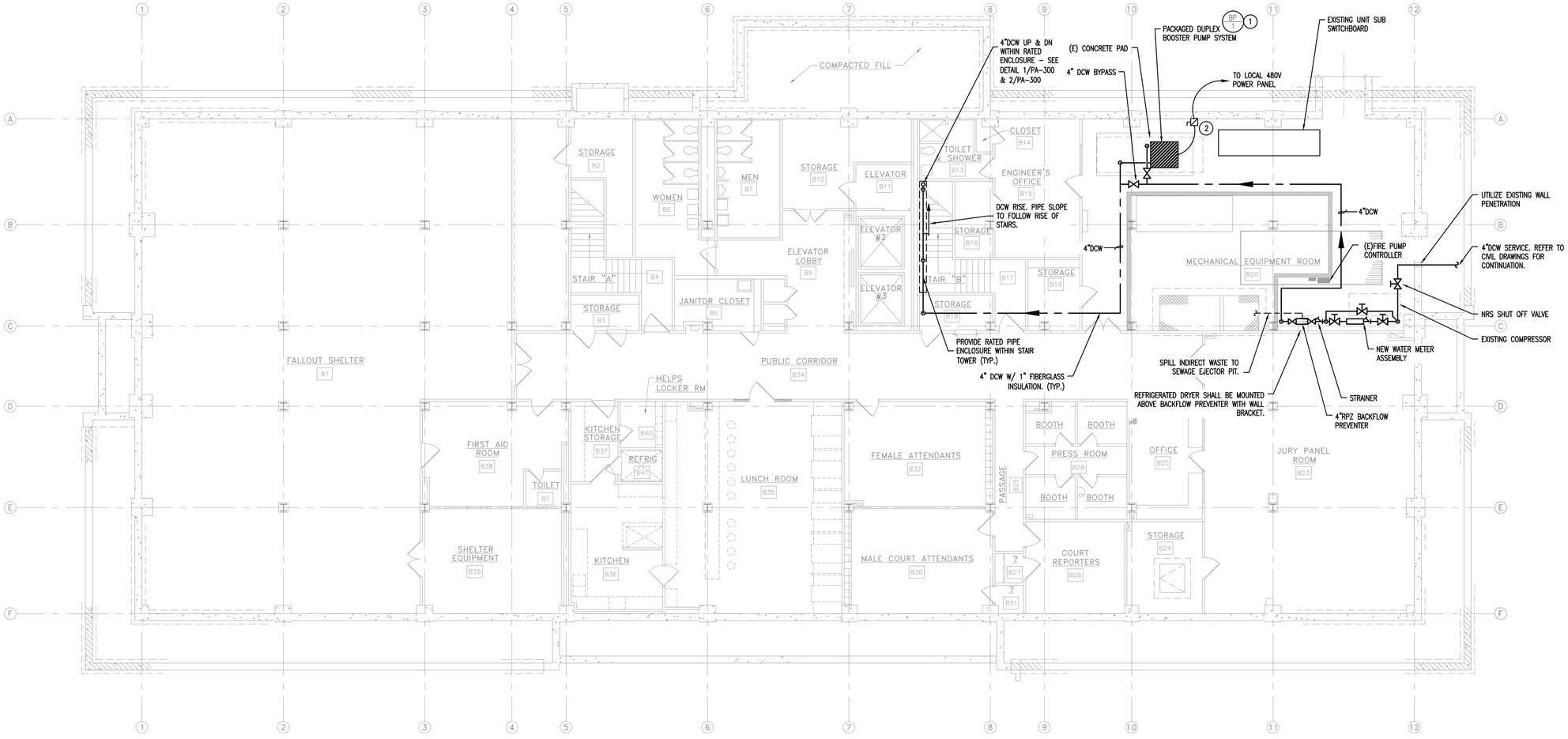
UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
PA-001



1 P-100 PLUMBING BASEMENT FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTES:

1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DRAWING A-007.

NEW WORK ELECTRICAL NOTES:

1. GENERAL NOTES:

A. CONTRACTOR SHALL INSTALL ALL (N) EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND SHALL MAINTAIN ALL CLEARANCES AS NOTED WITHIN THE WRITTEN INSTRUCTIONS.

B. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

C. ALL POWER SHUT DOWNS MUST BE COORDINATED WITH THE PROPERTY/OWNER'S REPRESENTATIVE.

D. THE ELECTRICAL CONTRACTOR SHALL MAKE AN ON SITE INSPECTION TO DETERMINE THE FULL SCOPE OF WORK AND WORKING CONDITIONS BEFORE SUBMITTING A PROPOSAL.

E. ALL CIRCUIT BREAKERS SERVING HVAC EQUIPMENT SHALL BE UL LISTED AS 'HACR'.

F. THE DRAWINGS ARE DIAGRAMMATIC. EXACT LOCATION OF EQUIPMENT, WIRING AND RACEWAYS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ARCHITECT APPROVAL.

G. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ELECTRICAL CHARACTERISTICS OF ALL NEW EQUIPMENT, MOTORS, ETC. BEFORE INSTALLING CABLING AND RACEWAY. IF THERE ARE ANY DISCREPANCIES BETWEEN THE ACTUAL RATING OF EQUIPMENT AT THE SITE AND THE DRAWINGS, THEN THE ENGINEER SHALL BE NOTIFIED.

H. ALL PANELS, WIRING DEVICES, BOXES, AND ENCLOSURES LOCATED INDOORS SHALL BE NEMA 1.

I. THE ELECTRICAL CONTRACTOR TO PROVIDE MOUNTING SUPPORTS FOR ALL DISCONNECT SWITCHES MOUNTED ON ROOF. USE P1000 UNISTRUT FOR ALL INDOOR SUPPORTS AND GALVANIZED P1000 UNISTRUT FOR ALL OUTDOOR SUPPORTS.

J. ALL RACEWAYS PENETRATING FIRE RATED PARTITIONS, WALLS, AND CEILINGS SHALL BE SEALED USING APPROVED FIRE RATED SEALANT TO MATCH THE REQUIRED WALL FIRE RATING.

K. THE ELECTRICAL CONTRACTOR SHALL SECURE FROM OTHER CONTRACTORS ON THE PROJECT: SHOP DRAWINGS TO VERIFY CHARACTERISTICS OF ALL EQUIPMENT TO BE WIRED. IF THE CONTRACTOR FINDS DISCREPANCIES BETWEEN THE SHOP DRAWINGS AND THE ELECTRICAL PLANS, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ENGINEER PROMPTLY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTIONS TO THE ELECTRICAL INSTALLATION IF THE DRAWING REVIEW IS NOT COMPLETED BY THE CONTRACTOR.

L. THE CONTRACTOR SHALL SUBMIT TO THE OWNER: CERTIFICATES OF INSPECTION FOR THE ELECTRICAL INSTALLATION FROM AN APPROVED INSPECTION AGENCY UPON COMPLETION OF ELECTRICAL WORK.

NEW WORK ELECTRICAL NOTES:

GENERAL NOTES CONTINUED:

M. THE ELECTRICAL SYSTEM AFFECTED BY THIS WORK SHALL BE TESTED FOR PROPER GROUNDING AND OPERATION. TEST HALL VERIFY THAT THE SYSTEM HAS NO SHORT CIRCUITS, OPENS, OVERLOADS, OR PANEL IMBALANCES. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS AND TEST INSTRUMENTS. ALL EQUIPMENT AND WIRING SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.

N. ALL WORK SHALL BE INSTALLED SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE, AND REPAIR. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO ACCOMPLISH THIS, SUBJECT TO THE APPROVAL OF THE ENGINEER.

O. THE ELECTRICAL CONTRACTOR SHALL USE MAXIMUM OF 6' OF FLEXIBLE CONDUIT FOR FOR EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT, AND FOR ALL MOTORS. USE LIQUID TIGHT FLEXIBLE CONDUIT IN WET OR DAMP LOCATIONS. INSTALL SEPARATE GROUND CONDUCTOR ACROSS FLEXIBLE CONNECTIONS.

P. ALL WIRING SHALL BE COPPER CONDUCTOR WITH 600 VOLT TYPE THHN, OR THWN INSULATION IN CONDUIT. THE MINIMUM SIZE WIRE FOR POWER CIRCUITS SHALL BE #12 AWG. SOLID CONDUCTORS SHALL BE USED FOR NUMBER 10 AND 12; STRANDED CONDUCTORS SHALL BE USED FOR NUMBER 8 AND LARGER. THE CONTRACTOR MAY USE METAL CLAD TYPE 'MC' WHERE ALLOWED BY THE NATIONAL ELECTRICAL CODE AND APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.

Q. ALL MATERIALS AND EQUIPMENT FURNISHED FOR THIS PROJECT SHALL BE NEW, LISTED, AND APPROVED BY UL.

R. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS, LICENSES AND PAY UTILITY COMPANY FEES.

S. ALL FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL HAVE: 600 VOLT RATING FOR 480 VOLT CIRCUITS. SIZE FUSES TO COMPLY WITH NAMEPLATE RATING OF EQUIPMENT SERVED.

2. NEW WORK KEYED NOTES:

GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (–) AND ARE NUMBERED AS FOLLOWS:

(1) ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL NEW 30AMP 3 POLE CIRCUIT BREAKER IN EXISTING LOCAL 480V 3 PHASE PANEL TO ACCOMMODATE INSTALLATION OF NEW BOOSTER PUMP INDICATED ON PLAN. ELECTRICAL CONTRACTOR SHALL PROVIDE 3 #8 & 1 #8 GND – 1" CONDUIT AND ALL APPURTENANCES NECESSARY FOR A COMPLETE INSTALLATION.

(2) ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL NEW 30AMP NEMA 1 FUSED DISCONNECT ADJACENT TO NEW BOOSTER PUMP SKID FOR FINAL TERMINATION.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING BASEMENT FLOOR PLAN

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

SUBMISSION:

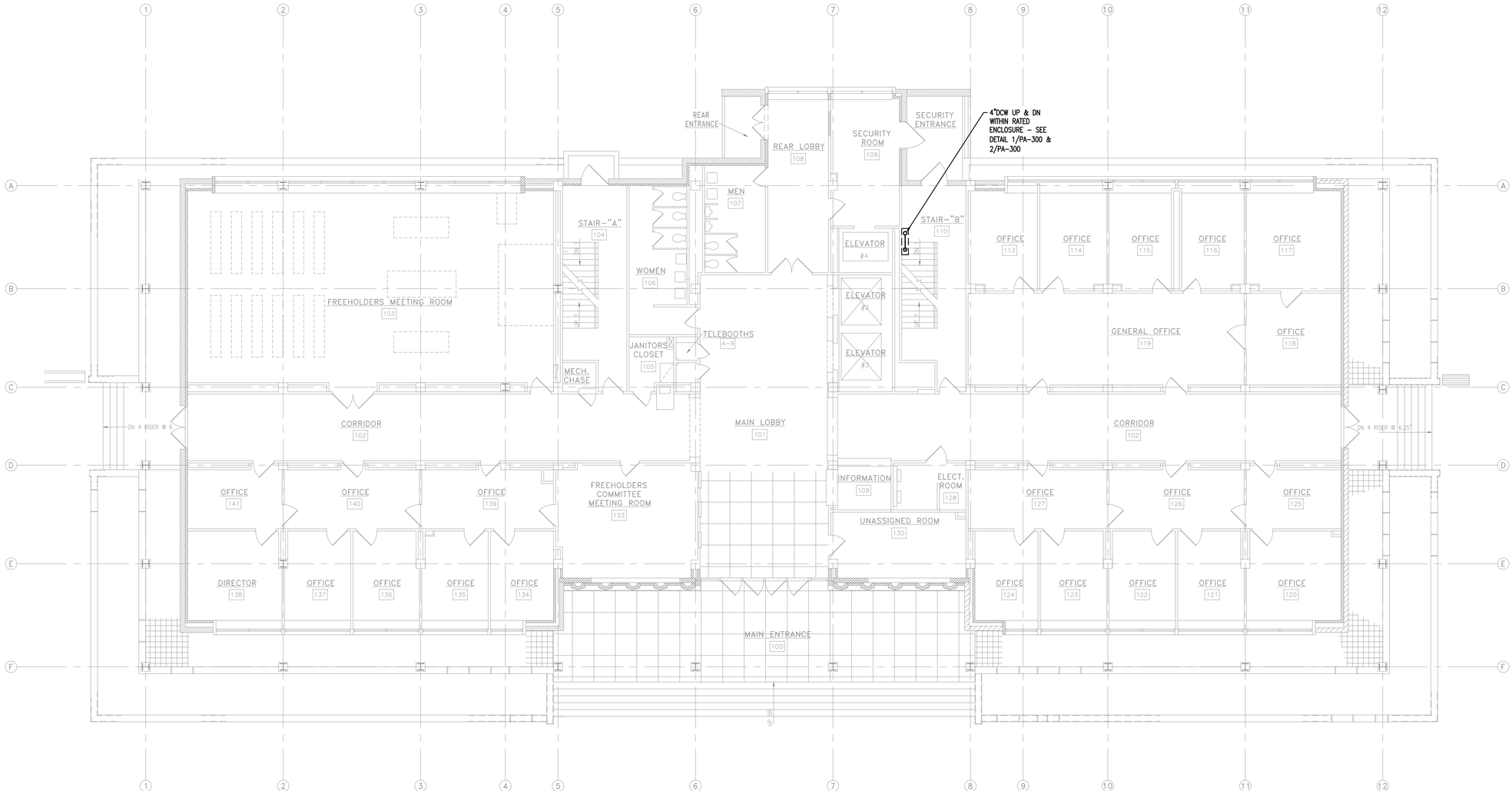
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA–100



1 P-101 **PLUMBING FIRST FLOOR PLAN**

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTES:

1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DRAWING A-007.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING FIRST FLOOR PLAN

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

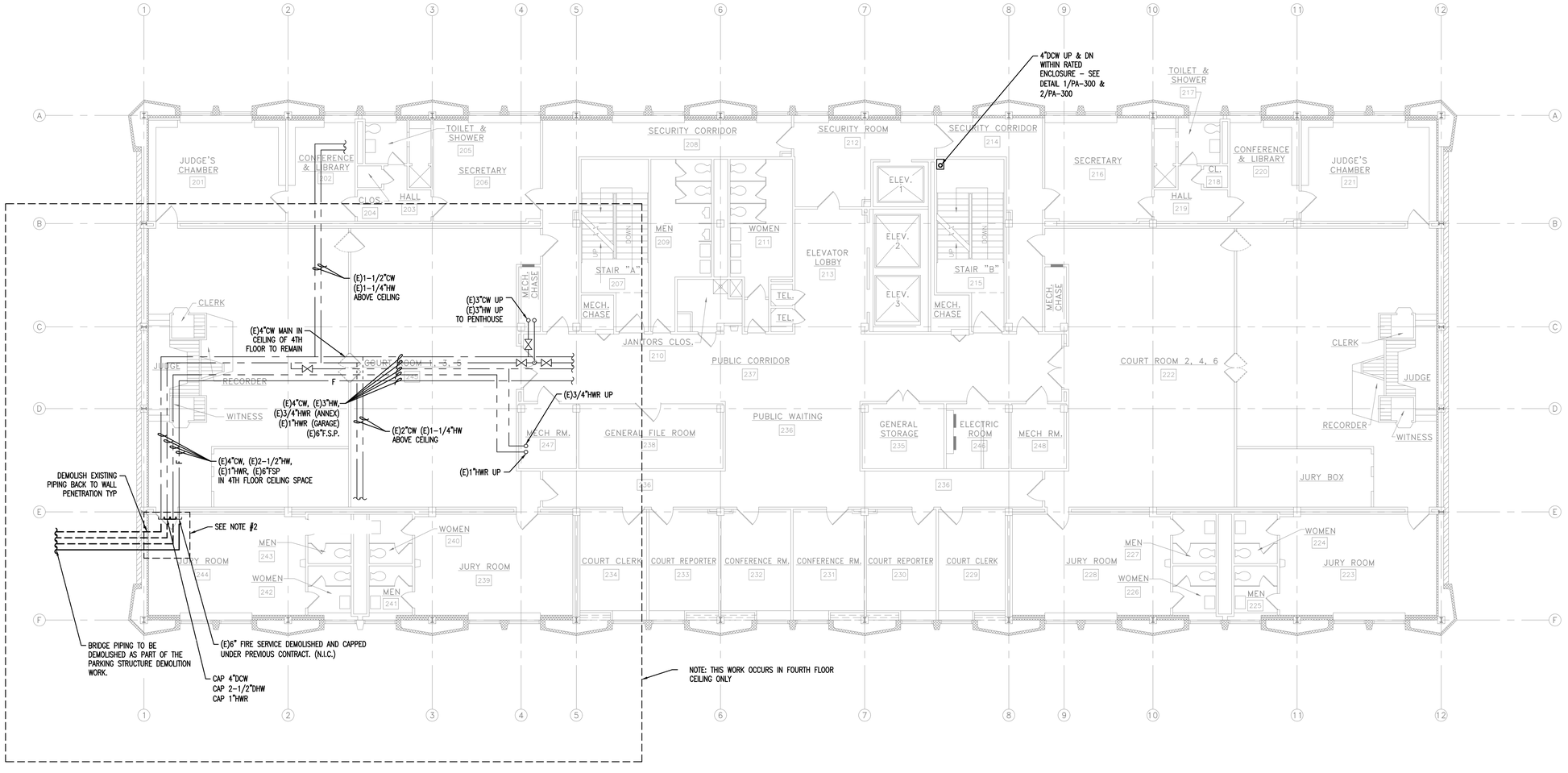
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA-101



1 / P-102 PLUMBING SECOND THRU FOURTH FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTES:

1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DRAWING A-007.

2. CONTRACTOR SHALL REMOVE CEILING AND EXISTING FINISHES AS REQUIRED TO ACCOMMODATE THE DEMOLITION AND CAPPING OF THE PLUMBING PIPING. REPLACE CEILING TILES AND/OR FINISHES TO MATCH EXISTING. ANY EXISTING DAMAGED FINISHES ARE THE RESPONSIBILITY OF THE CONTRACTOR TO FIX.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING SECOND THRU FOURTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

SUBMISSION:

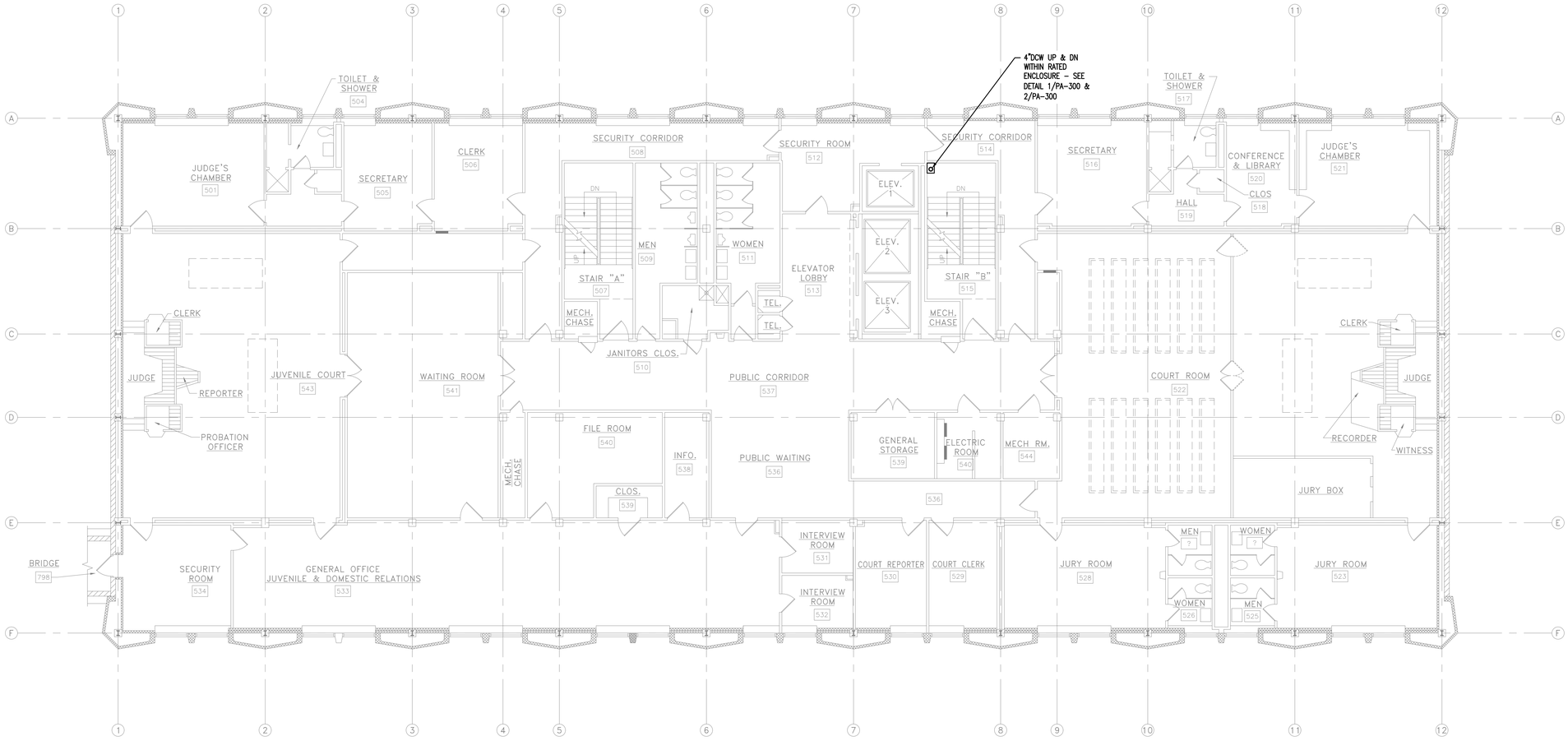
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA-102



1 P-103 PLUMBING FIFTH FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTES:

1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DRAWING A-007.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING FIFTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

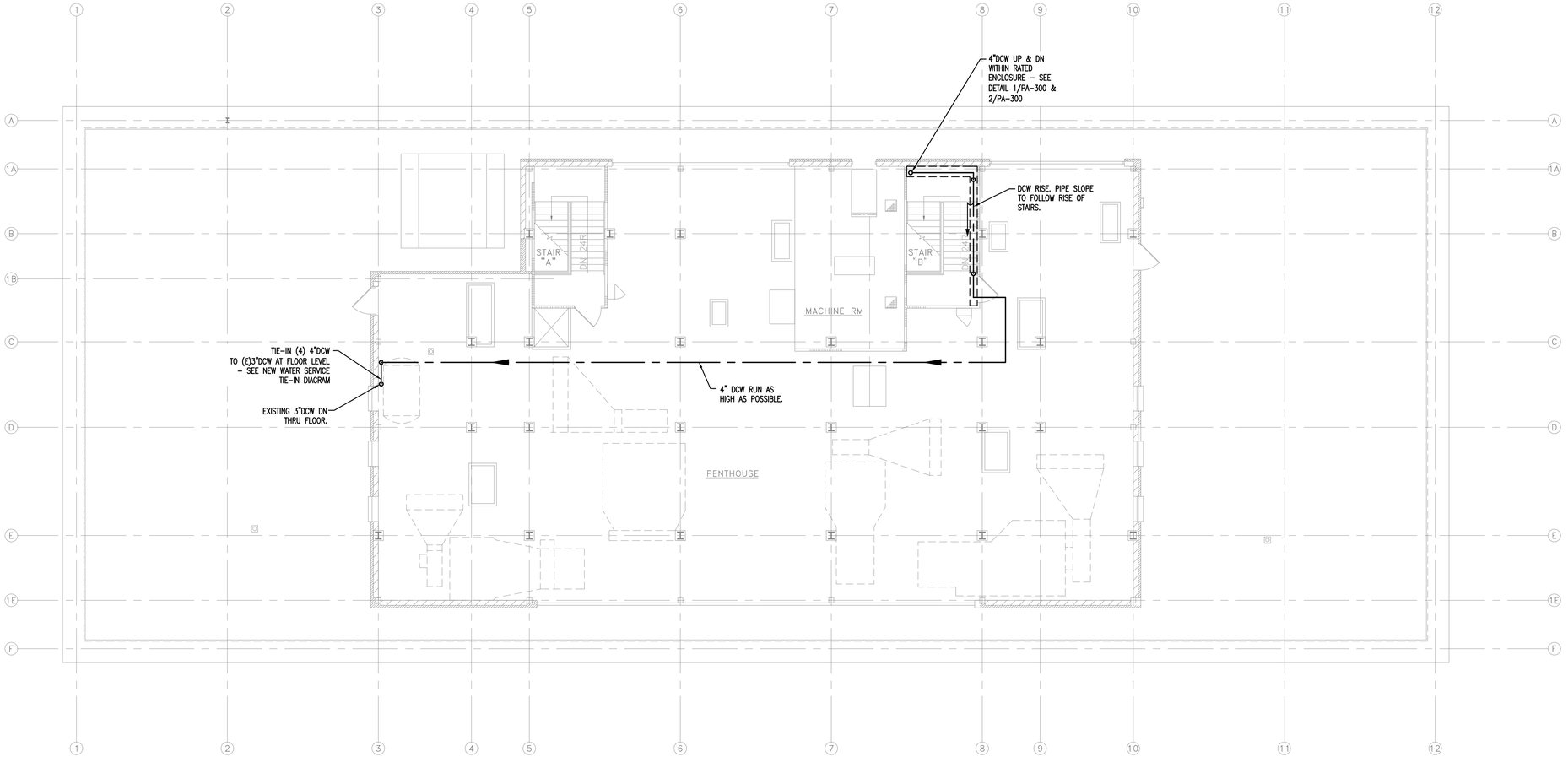
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA–103



1 P-104 PLUMBING PENTHOUSE FLOOR PLAN

SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NOTES:

1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DRAWING A-007.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING PENTHOUSE FLOOR PLAN

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

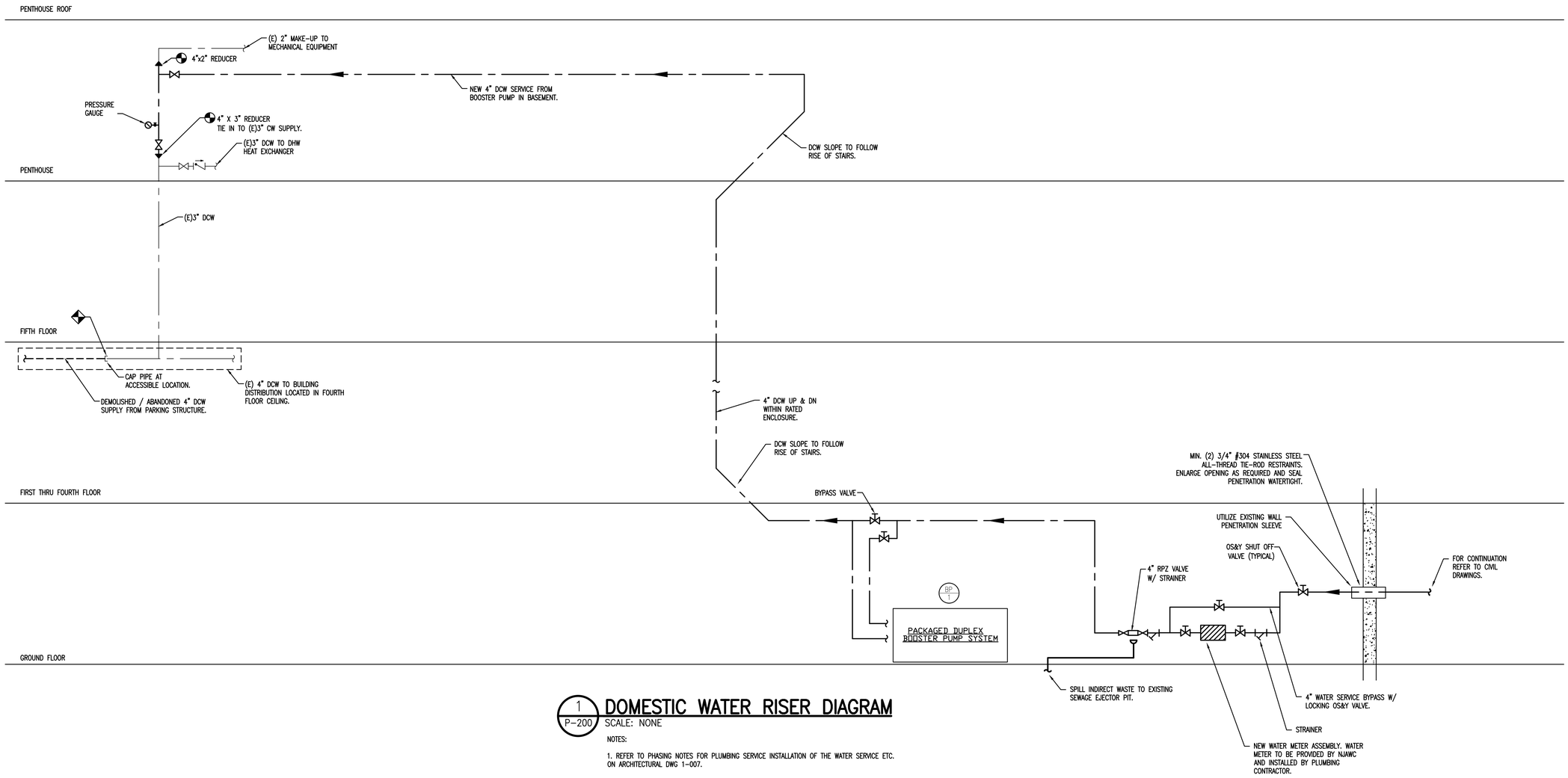
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA–104



1 P–200 DOMESTIC WATER RISER DIAGRAM

SCALE: NONE

NOTES:

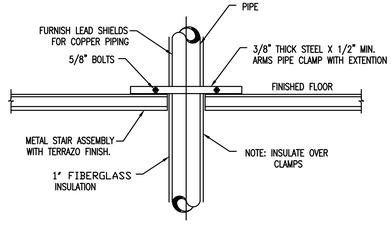
1. REFER TO PHASING NOTES FOR PLUMBING SERVICE INSTALLATION OF THE WATER SERVICE ETC. ON ARCHITECTURAL DWG 1–007.

DOMESTIC WATER PRESSURE BOOSTER SYSTEM

BP 1

EQUIP. NO.	SERVICE LOCATION	NO. OF PUMPS	GPM/EA PUMP	SYSTEM PRESSURE VALUES				MOTOR DATA AND VALUES			CONTROL PANEL				REMARKS	DESIGN BASIS MODEL
				TDH [Feet]	SUCTION [PSI]	BOOST [PSI]	SET [PSI]	RPM	HP	KW PER YR.	VOLTAGE	PHASE	FULL LOAD	MAX. SCCR		
BP-1	BASEMENT MECH ROOM	2	119	152.46	30	66	96.00	3,450	10	22275.01	460	Three Phase	25.6	100KAIC	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	QUANTUMFLO PRODIGY DUPLEX QES_ 40-160-10

1. NET BOOST PRESSURE IS CALCULATED BY SYSTEM SET PRESSURE MINUS SUCTION PRESSURE LESS SYSTEM LOSSES OF 5 PSI
2. SYSTEM SUBMITTALS SHALL INCLUDE CERTIFICATE NUMBER FOR NSF61 CERTIFICATION, UL508A AND QCZJ 3RD PARTY COMPLIANCE.
3. SYSTEM CONTROLS MUST COMPLY WITH AND PROVIDE FOR EITHER CONTROL LOGIC OR REMOTE SENSOR IN ACCORDANCE WITH ANSI/ASHRAE/IES STANDARD 90.1 ENERGY STANDARD
4. PROVIDE 5-YEAR WARRANTY ON COMPLETE SYSTEM AND INCLUDE WARRANTY CERTIFICATE WITH DETAILS IN SUBMITTALS
5. SYSTEM SHALL BE PRE-SET TO SYSTEM SITE CONDITIONS BY SIMULATING SUCTION PRESSURE. HYDROSTATIC-ONLY TESTING IS NOT ACCEPTABLE.
6. THE INDUSTRIAL CONTROLLER SHALL BE IN COMPLIANCE WITH CURRENT NEC, SECTION 409.110 HAVING A MAXIMUM 100K AVAILABLE FAULT CURRENT.
7. SCCR RATINGS MUST BE INCLUSIVE OF ALL COMPONENTS WITHIN THE ENCLOSURE WITHOUT THE NEED TO PROVIDE ADDITIONAL UPSTREAM PROTECTION.
8. EQUAL SYSTEMS MUST SHOW MATHEMATICAL ANALYSIS PROVING THAT THE ALTERNATE SUPPLIER MEETS OR EXCEEDS THE KW CAPACITY LISTED.
9. PROVIDE THE FOLLOWING OPTIONS: NONE REQUIRED
10. REPRESENTATIVE: WALES-DARBY, NEW JERSEY. PHONE: (732) 560-1001



2 P–200 DETAIL – PIPE RISER SUPPORT

SCALE: NTS

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING RISER DIAGRAM

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

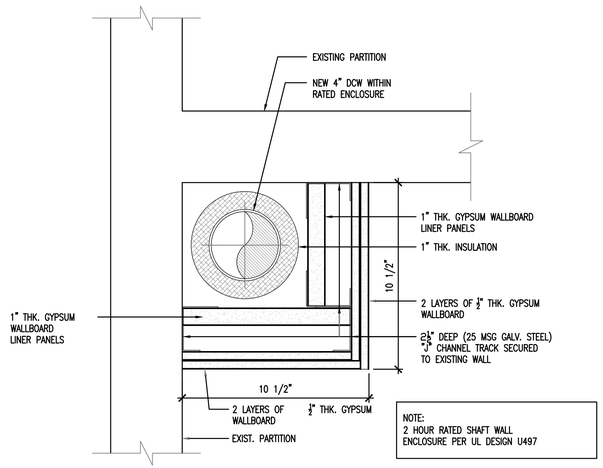
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

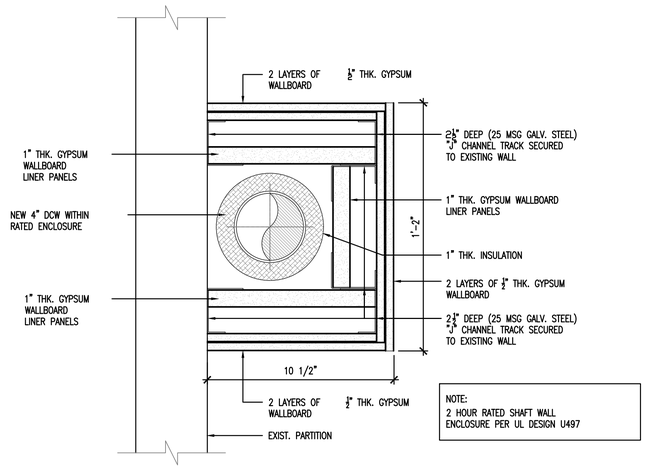
Drawing No.

PA–200



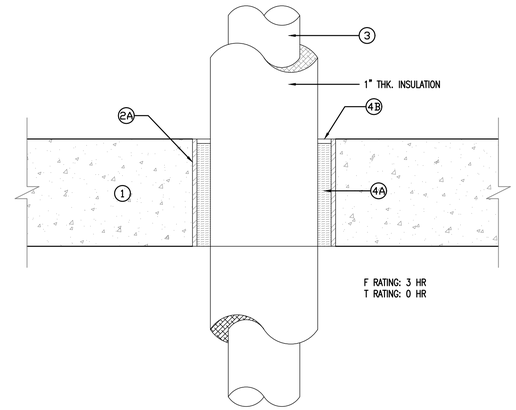
1 P-300 NEW 2 HR. RATED VERTICAL ENCLOSURE IN STAIRWELL B – BASEMENT, 2ND, 3RD & 4TH FLOORS

SCALE: NTS



2 P-300 NEW 2 HR. RATED HORIZONTAL ENCLOSURE IN STAIRWELL B – 1ST FLOOR & PENTHOUSE FLOOR

SCALE: NTS



3 P-300 THROUGH–PENETRATION FIRESTOP SYSTEM PER UL C–AJ–1226

SCALE: NTS

1. FLOOR OR WALL ASSEMBLY – MIN 4–1/2 IN. THICK REINFORCED LIGHTWEIGHT OR NORMAL WEIGHT (100–150 PCF) CONCRETE. WALL MAY ALSO BE CONSTRUCTED OF ANY UL CLASSIFIED CONCRETE BLOCKS. MAX DIAMETER OF OPENING IS 32 IN.

2. METALLIC SLEEVE – (OPTIONAL) NOM 32 IN. DIAMETER (OR SMALLER) SCHEDULE 40 (OR HEAVIER) STEEL SLEEVE CAST OR GROUTED INTO FLOOR OR WALL ASSEMBLY, FLUSH WITH FLOOR OR WALL SURFACES OR EXTENDING A MAX OF 3 IN. ABOVE FLOOR OR BEYOND BOTH SURFACES OF WALL.

2A. SHEET METAL SLEEVE – (OPTIONAL) MAX 6" DIA., MIN. 26 GA. GALV. STEEL PROVIDED WITH A 26 GA. GALVANIZED STEEL SQUARE FLANGE SPOT WELDED TO THE SLEEVE AT APPROXIMATE MID–HEIGHT AND SIZED TO BE A MIN OF 2" LARGER THAN THE SLEEVE DIAMETER. THE SLEEVE IS TO BE CAST IN PLACE AND MAY EXTEND A MAX OF 4" BELOW THE BOTTOM OF THE DECK AND A MAX OF 1" ABOVE THE TOP SURFACE OF THE CONCRETE FLOOR.

2B. SHEET METAL SLEEVE – (OPTIONAL) – MAX 12" DIAMETER, MIN. 24 GA. GALVANIZED STEEL PROVIDED WITH A 24 GA. GALVANIZED STEEL SQUARE FLANGE SPOT WELDED TO THE SLEEVE AT APPROXIMATE MID–HEIGHT AND SIZED TO BE A MIN OF 2" LARGER THAN THE SLEEVE DIAMETER THE SLEEVE IS TO BE CAST IN PLACE AND MAY EXTEND A MAXIMUM OF 4" BELOW THE BOTTOM OF THE DECK AND A MAX. OF 1" ABOVE THE TOP SURFACE OF THE CONCRETE FLOOR.

3. THROUGH–PENETRANT – ONE METALLIC PIPE, TUBE OR CONDUIT TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRESTOP SYSTEM. THE ANNULAR SPACE BETWEEN PENETRANT AND PERIPHERY OF OPENING SHALL BE MINIMUM 0" (POINT CONTACT) TO MAX 1–7/8" PENETRANT MAY BE INSTALLED WITH CONTINUOUS POINT CONTACT. PENETRANT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWING TYPES AND SIZES OF METALLIC PENETRANTS MAY BE USED:
   A. STEEL PIPE – NOM. 30" DIA. (OR SMALLER) SCHEDULE 10 (OR HEAVIER) STEEL PIPE.
   B. IRON PIPE – NOM. 30" DIA. (OR SMALLER) CAST OR DUCTILE IRON PIPE.
   C. COPPER PIPE – NOM. 6" DIA. (OR SMALLER) REGULAR (OR HEAVIER) COPPER PIPE.
   D. COPPER TUBING – NOM. 6" DIA. (OR SMALLER) TYPE L (OR HEAVIER) COPPER TUBING.
   E. CONDUIT – NOM. 6" DIA. (OR SMALLER) STEEL CONDUIT.
   F. CONDUIT – NOM. 4" DIA. (OR SMALLER) STEEL ELECTRICAL METALLIC TUBING (EMT).

4. FIRESTOP SYSTEM – THE FIRESTOP SYSTEM SHALL CONSIST OF THE FOLLOWING:
   A. PACKING MATERIAL – MIN. 4" THICKNESS OF MIN. 4 PCF MINERAL WOOL BATT. INSULATION FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. PACKING MATERIAL TO BE RECESSED FROM TOP SURFACE OF FLOOR OR SLEEVE OR FROM BOTH SURFACES OF WALL OR SLEEVE AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL.
   B. FILL, VOID OR CAVITY MATERIAL – SEALANT – MIN 1/4" THICKNESS OF FILL MATERIAL APPLIED WITHIN THE ANNULUS, FLUSH WITH TOP SURFACE OF FLOOR OR SLEEVE OR WITH BOTH SURFACES OF WALL OR SLEEVE. AT THE POINT OR CONTINUOUS CONTACT LOCATIONS BETWEEN PENETRANT AND CONCRETE OR SLEEVE, A MIN 1/4" DIA. BEAD OF FILL MATERIAL SHALL BE APPLIED AT THE CONCRETE OR SLEEVE/PIPE PENETRANT INTERFACE ON THE TOP SURFACE OF FLOOR AND ON BOTH SURFACES OF WALL.

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

PLUMBING DETAILS

PROJECT TITLE:

UNION COUNTY ANNEX BLDG. NEW WATER SVC 27-49 ELIZABETH TOWN PLAZA

SUBMISSION:

ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

PA–300

FIRE ALARM GENERAL NOTES

1. ALL ELECTRICAL WORK TO BE INSTALLED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE ADOPTED BY THE UNIFORM CONSTRUCTION CODE - STATE OF NEW JERSEY AND ANY OTHER PARTY HAVING JURISDICTION.
2. THE FIRE ALARM SYSTEM SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL CODE REQUIREMENTS AND ANY OTHER PARTY HAVING JURISDICTION.
3. ALL ELECTRICAL AND EQUIPMENT FOR THE PROJECT SHALL BE NEW AND APPROVED BY UNDERWRITERS LABORATORY (U.L) OR ANY OTHER NATIONALLY RECOGNIZED TESTING AGENCY UNLESS NOTED OTHERWISE ON DRAWINGS.
4. ALL NECESSARY PERMITS, INSPECTIONS, AND LICENSES SHALL BE PROCURED BY THE CONTRACTOR AND ALL PERMIT AND INSPECTION FEES PAID BY OWNER. SUBMIT TO THE OWNER DUPLICATE CERTIFICATES OF INSPECTION FROM THE APPROVED INSPECTION AGENCY.
5. UPON COMPLETION OF THE WORK, THE ENTIRE WIRING SYSTEM SHALL BE FREE FROM GROUNDS, SHORT CIRCUITS, OPENS, OVERLOADS AND IMPROPER VOLTAGES.
6. PRIOR TO FINAL ACCEPTANCE OF THE WORK, A WRITTEN STATEMENT SHALL BE SUBMITTED TO THE OWNER GUARANTEEING ALL EQUIPMENT AND SYSTEMS AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR ONE (1) YEAR FROM THE DATE OF ACCEPTANCE. UPON NOTICE, ALL DEFECTIVE EQUIPMENT, MATERIALS AND SYSTEMS SHALL BE PROMPTLY REPAIRED AT NO EXPENSE TO THE OWNER.
7. THIS SET OF DRAWINGS IS DIAGRAMMATIC IN NATURE AND INDICATES THE GENERAL ARRANGEMENT OF THE SYSTEM AND APPROXIMATE LOCATIONS OF THE EQUIPMENT. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THAT THERE IS ADEQUATE SPACE AT THE LOCATIONS INDICATED FOR ALL EQUIPMENT PRIOR TO INSTALLATION OF SAME. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ALL DIMENSIONS IN THE FIELD, PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
8. ALL DEVICES OR EQUIPMENT SHOWN IN SYMBOL FORM SHALL BE WIRED TO ITS RESPECTIVE PANEL.
9. ALL WIRING, CONNECTIONS AND DEVICES SHALL BE PROVIDED TO COMPLY WITH THE GROUNDING REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND THE DRAWINGS UNLESS NOTED OTHERWISE. ALL EXPOSED NON-CURRENT CARRYING ELECTRICAL EQUIPMENT METALLIC PARTS, RACEWAY SYSTEMS AND WIRING SYSTEM GROUNDING CONDUCTORS SYSTEM SHALL BE GROUNDED.
10. THE ELECTRICAL CONTRACTOR SHALL PAINT RED IN COLOR ALL JUNCTION BOXES AND CONDUIT ASSOCIATED WITH THE FIRE ALARM SYSTEM. LABEL WITH PERMANENT MARKER ALL JUNCTION BOXES AND OUTLET BOXES WITH CIRCUIT NUMBER, PANEL IDENTIFICATION OR ADDRESS AS REQUIRED.
11. ALL CUTTING AND PATCHING REQUIRED FOR THE FIRE ALARM WORK SHALL BE THE RESPONSIBILITY OF THE FIRE ALARM CONTRACTOR.
12. ALL HOLES OR VOIDS CREATED TO ROUTE CONDUIT THROUGH FIRE RATED FLOORS AND WALLS SHALL BE SEALED WITH AN INTUMESCENT MATERIAL CAPABLE OF EXPANDING UP TO 8 TO 10 TIMES WHEN EXPOSED TO A TEMPERATURE OF 250 DEGREES FAHRENHEIT AND ABOVE. ACCEPTABLE SEALING MATERIAL SUCH AS 3M FIRE BARRIER CAULK, PUTTY, STRIP AND SHEET FORM SHALL HAVE I.C.B.O. AND BOCA APPROVED RATING OF 3 HOURS PER ASTM E-814 (U.L. 1479) AS PER NEC ART. 300-21.
13. A COMPLETE SET OF "AS-BUILT" DRAWINGS, (1) SET IN HARD COPY REPRODUCIBLE AND (1) SET OF ELECTRONIC FILES PRODUCED IN PDF FORMAT SHALL BE FURNISHED TO THE OWNER UPON PROJECT COMPLETION.
14. ALL EQUIPMENT, DEVICES AND CIRCUITS SHALL BE LABELED ACCORDING TO OWNER REQUIREMENTS.
15. FIRE ALARM CABLE LOCATED ABOVE ACCESSIBLE CEILINGS SHALL BE INDEPENDENTLY SUPPORTED FROM THE STRUCTURE. CABLES SHALL NOT BE LAID ON CEILING PANELS.
16. ALL WIRING AND EQUIPMENT INSTALLED IN DUCTS, PLENUMS AND OTHER AIR HANDLING SPACES SHALL BE PLENUM RATED AND CONFORM TO NEC, ARTICLE 300-22.
17. DO NOT INSTALL ANY A.C. CURRENT CARRYING CONDUCTORS CLOSE TO OR IN THE SAME RACEWAY WITH FIRE ALARM SYSTEM CONDUCTORS.
18. THE FIRE ALARM CONTRACTOR SHALL ASSURE THAT ANY FIRE ALARM DEVICE OR PRODUCT WHICH IS TO BE RELOCATED OR REUSED IS IN PROPER WORKING CONDITION IN ACCORDANCE WITH INSTRUCTIONS INCLUDED IN ITS LISTING OR LABELING. ANY DEVICE OR PRODUCT FOUND TO BE DEFECTIVE OR DAMAGED SHALL BE REPLACED WITH NEW.
19. SMOKE DETECTORS SHALL NOT BE INSTALLED UNTIL AFTER THE CONSTRUCTION CLEAN-UP IS COMPLETE AND FINAL. DETECTORS THAT HAVE BEEN INSTALLED PRIOR TO FINAL CLEAN-UP BY ALL TRADES SHALL BE CLEANED OR REPLACED.
20. THE FIRE ALARM SYSTEM SHALL NOT EXCEED 70% OF IT'S RATED CAPACITY.
21. SUBMIT FIRE ALARM SYSTEM SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL.
22. ALL FIRE ALARM CABLING SHALL BE "FPLP" RATED OR RUN IN A MINIMUM 3/4" CONDUIT.
23. ALL NEW, RELOCATED AND EXISTING TO REMAIN FIRE ALARM DEVICES THAT ARE WITHIN THE LIMITS OF THIS PROJECT SHALL BE IDENTIFIED ON THE UPDATED FIRE ALARM GRAPHICS AT THE FCC.
24. CONTRACTOR SHALL PREPARE SHOP DRAWINGS, AT HIS OWN EXPENSE, PREPARED BY A QUALIFIED ENGINEER LICENSED IN THE STATE OF NEW JERSEY. SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW TO THE ENGINEER PRIOR TO PERFORMANCE.
25. ACTUATION OF ANY NEW FIRE ALARM DEVICES SHALL SEND AN ALARM SIGNAL TO THE BUILDING'S EXISTING FIRE COMMAND CENTER (FCC).
26. ALL WIRING SHALL COMPLY WITH PROJECT SPECIFICATIONS, 2017 NEC, 2016 NFPA 72, 2018 IBC (NEW JERSEY EDITION), ADAAG, UL 1971, AND THE REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION. ALL WIRING IN PUBLIC AREAS SHALL BE CONCEALED. ALL EXPOSED WIRING OR WIRING INSTALLED IN LOCATIONS SUBJECT TO DAMAGE SHALL BE INSTALLED IN METAL RACEWAY PAINTED RED. ALL WIRING AND RACEWAYS SHALL BE INSTALLED IN A NEAT AND PROFESSIONAL MANNER.
27. ALL WIRE AND CABLE SHALL HAVE A WIRE MARKER ON EACH END, OR EQUAL. ALL MARKERS SHALL BE TYPED. SHIELDS ON ALL SHIELDED CABLE SHALL BE CONTINUOUS, GROUNDED AT THE FIRE ALARM CONTROL PANEL ONLY, AND ISOLATED FROM GROUND ELSEWHERE.
28. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING PATCHING AND PAINTING REQUIRED FOR COMPLETE FIRE ALARM SYSTEM INSTALLATION.
29. MOUNTING FOR ALL DEVICES SHALL COMPLY WITH IBC 2018 (NEW JERSEY EDITION), 2016 NFPA 72, 2017 NEC, AND ADAAG.
30. FOR CONDUIT APPLICATIONS, USE ELECTRICAL METALLIC TUBING (EMT) AT ALL LOCATIONS INDOORS AND SCHEDULE 80 PVC CONDUIT OUTDOORS. ALL CONDUIT SIZE SHALL BE 3/4" MINIMUM.
31. CONTRACTOR SHALL REPAIR/PATCH AND /OR REPAINT TO MATCH ADJACENT AREAS, ANY AREAS DAMAGED (OR WHERE ITEMS WERE REMOVED/DEMOLISHED) BY WORK OF THIS CONTRACT.
32. THE FIRE ALARM VENDOR MUST CALCULATE THE NOTIFICATION APPLIANCES CANDELA RATINGS AND DESIGNATE THEM ON THE SHOP DRAWINGS. ALL STROBE SETTINGS MUST COMPLY WITH 2016 NFPA 72 REQUIREMENTS.
33. ACCEPTANCE TESTING MUST BE PERFORMED IN ACCORDANCE WITH 2016 NFPA 72 AS ADOPTED BY THE STATE OF NEW JERSEY.
34. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL PROGRAMMING NECESSARY FOR THE MODIFIED FIRE ALARM SYSTEM. ALL FIRE ALARM SYSTEM PROGRAMMING SHALL BE PERFORMED BY A TECHNICIAN CERTIFIED BY THE FIRE ALARM SYSTEM'S MANUFACTURER TO PERFORM THIS WORK. SUBMIT AS PART OF THE FIRE ALARM SHOP DRAWING ALL FIRE ALARM TECHNICIAN'S MANUFACTURER CERTIFICATIONS.
35. UPON COMPLETION OF FINAL TESTING, THE FIRE ALARM SYSTEM MANUFACTURER SHALL SUBMIT ELECTRONIC AND HARD COPY SETS OF RECORD DRAWINGS DETAILING AS-BUILT CIRCUITING AND INCORPORATING ALL FIELD AND DESIGN DIRECTIVES GIVEN THROUGH OUT THE PROJECT. ELECTRONIC AS-BUILT DRAWINGS SHALL BE IN PDF FORMAT.

FIRE ALARM PERFORMANCE NOTES:

1. PROVIDE THE SERVICES OF A QUALIFIED FIRE ALARM CONTRACTOR/VENDOR WITH A MINIMUM OF 10-YEARS OF CERTIFIABLE PROFESSIONAL EXPERIENCE WITH EST FIRE ALARM SYSTEMS AND IS LOCATED WITHIN 100-MILES OF THE PROJECT SITE.
2. ELECTRICAL AND FIRE ALARM CONTRACTORS SHALL PROVIDE ALL MANPOWER, EQUIPMENT, AND LABOR AS NECESSARY TO PROVIDE A COMPLETE AND OPERABLE SYSTEM. TEST AND ADJUST NEW FIRE ALARM SYSTEM AS NOTED BELOW.
3. ALL FIRE ALARM TESTING SHALL OCCUR BETWEEN THE HOURS OF 9:00AM AND 4:00PM WEEKDAYS, EXCLUDING CITY HOLIDAYS.
4. TEST AND ADJUST EACH HOME RUN CIRCUIT INDEPENDENTLY FROM OTHER HOME RUNS. ADJUST SYSTEM GAIN SO THAT ALL FIRE ALARM SPEAKERS PROVIDE 100DB SPL 'A' WEIGHTED AT 5-FEET ABOVE FINISHED FLOOR. USE A CALIBRATED SOUND PRESSURE METER (PER 2016 NFPA 72) DURING FIRE ALARM SYSTEM TESTS AND ADJUSTMENTS. BEGIN ALL TESTS WITH SYSTEM GAIN COMPLETELY OFF. DO NOT ACTIVATE OR TEST SYSTEM WITH AMPLIFIER GAINS FULLY OPEN.
5. DEMONSTRATE SYSTEM PERFORMANCE TO THE OWNER AND LOCAL FIRE INSPECTOR AT THE SPECIFIED GAIN SETTINGS. ADJUST SOUND LEVELS AS NECESSARY TO SATISFY THE OWNER AND LOCAL FIRE INSPECTOR.
6. FIRE ALARM CONTRACTOR SHALL PROVIDE NEW FIRE ALARM STROBE DEVICES IN EACH ADA GUESTROOMS' LIVING/SLEEPING AREAS AND IN ALL ASSOCIATED ADA GUESTROOMS' BATHROOMS. WHERE EXISTING FIRE ALARM STROBES ARE ALREADY PRESENT, CONTRACTOR MAY TEST AND CONFIRM PROPER OPERATION OF THE EXISTING DEVICE, AND THEN REUSE THE EXISTING FIRE ALARM STROBE BEDROOM IN LIEU OF INSTALLING A NEW DEVICE.
7. FIRE ALARM CONTRACTOR SHALL TEST ALL GUEST FLOORS' EXISTING GUESTROOM AND PUBLIC AREA SMOKE DETECTORS, MANUAL PULL STATIONS, DUCT SMOKE DETECTORS, HEAT DETECTORS AND FIRE PROTECTION WATERFLOW SWITCHES TO CONFIRM PROPER OPERATION. CONTRACTOR SHALL REPORT TO OWNER ANY FIRE ALARM DEVICE WHICH DOES NOT PROPERLY PASS TESTING AND REQUIRES SERVICE/MAINTENANCE.
8. CONTRACTORS SHALL CONTINUOUSLY PROTECT AND MAINTAIN OPERATIONS OF BUILDING'S EXISTING FIRE ALARM SYSTEM THROUGHOUT CONSTRUCTION, UNTIL THE BUILDING'S FIRE ALARM SYSTEM'S WORK IS SUCCESSFULLY COMPLETED, TESTED AND FINAL INSPECTIONS HAVE BEEN PERFORMED BY THE LOCAL INSPECTORS.
9. ANY REQUIRED POWER CONNECTIONS, CONDUCTOR TYPES AND SIZES, BATTERY AND VOLTAGE DROP CALCULATIONS ARE TO BE SHOWN ON THE FIRE ALARM SHOP DRAWINGS.
10. FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE SET OF PROJECT SUBMITALS INCLUDING BUT NOT LIMITED TO FLOOR PLANS, BATTERY CALCULATIONS, INSTALLATION DETAILS, ETC.. TO SATISFY REQUIREMENTS OF THE LOCAL INSPECTION AGENCY FOR PERMITTING.

FIRE ALARM LEGEND

PP-1	HOME RUN ARROW INDICATES PANEL AND CIRCUIT NUMBER
	TELEPHONE OUTLET, 3/4" CONDUIT W/PULL STRING STUBBED UP 6" ABOVE CEILING
	FIRE ALARM MANUAL PULL STATION
	FIRE ALARM COMBINATION SPEAKER/STROBE
	FIRE ALARM STROBE
	FIRE ALARM SPEAKER APPLIANCE
	ADDRESSABLE MULTICRITERIA SMOKE DETECTOR
	ADDRESSABLE HEAT DETECTOR
	ADDRESSABLE ENVIRONMENTAL TEMPERATURE SENSOR
MOD	ADDRESSABLE MODULE
CO	CARBON MONOXIDE DETECTOR
S	AUDIO SHUNT
D	SMOKE DETECTOR (DUCT)
FACP	FIRE ALARM CONTROL PANEL
ADA	AMERICAN DISABILITY ACT
D	DEMOLISH AND REMOVE
E	EXISTING TO REMAIN
FS	FLOW SWITCH
H/C	HANDICAP
N	
R	EXISTING TO BE RELOCATED
RE	EXISTING SHOWN RELOCATED IN NEW LOCATION
TS	TAMPER SWITCH
WP	WEATHER PROOF

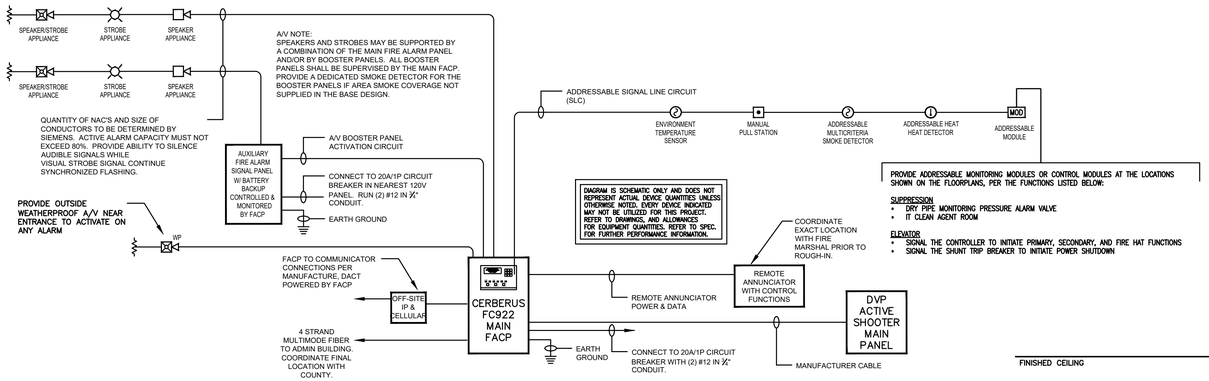
STROBE COVERAGE	
ROOM	CANDELA
20' X 20'	15cd/15-75cd
30' X 30'	30cd, (2) 15cd, (2) 15/75cd
40' X 40'	75cd, 60cd, (2) 30cd
50' X 50'	110cd, (2)75cd, (2)60cd
CORRIDOR	15cd

NOTES:
1. ALL SYMBOLS OR ABBREVIATIONS ARE NOT NECESSARILY USED ON THE CONTRACT DRAWINGS.
2. THE SYMBOLS FOR WORK TO BE DEMOLISHED AND REMOVED ARE THE SAME AS THOSE ABOVE EXCEPT THEY ARE DRAWN WITH A DASHED LINETYPE.

DRAWING SHEET INDEX

UNION COUNTY PARKING GARAGE

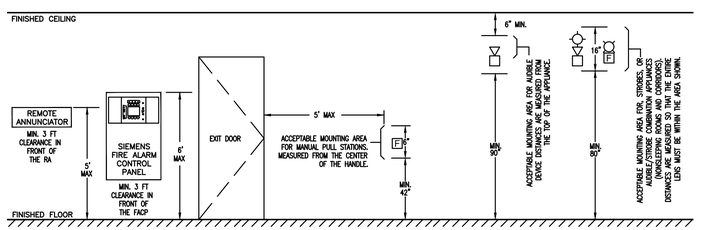
SHEET NO.	DRAWNG NUMBER	DRAWING TITLE	DATE	ISSUE
			07/28/2021	ISSUED FOR BIDDING
		FIRE ALARM		
1	FA-001	ELECTRICAL FIRE ALARM LEAD SHEET		X
2	FA-101	ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - FIRE ALARM		X
3	FA-102	ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - FIRE ALARM		X
4	FA-103	ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - FIRE ALARM		X
5	FA-104	ELECTRICAL - NEW GARAGE EIGHTH FLOOR PLAN - FIRE ALARM		X



FIRE ALARM SYSTEM RISER NOTES:

1. THIS RISER DIAGRAM IS BASED ON AN ADDRESSABLE FIRE ALARM CONTROL PANEL FOR ASME 17.1 ELEVATOR LIFE SAFETY INTERFACE AND DRY SPRINKLER MONITORING. THIS DIAGRAM IS SCHEMATIC ONLY AND DOES NOT REPRESENT ACTUAL DEVICE QUANTITIES UNLESS OTHERWISE NOTED. IT IS A REPRESENTATION OF THE INTENDED SYSTEM FOR THIS PROJECT. SEE THE FLOOR PLANS FOR EXACT QUANTITIES AND LOCATIONS OF FIELD EQUIPMENT. SEE THE PROJECT SPECIFICATIONS FOR PERFORMANCE AND COMPLIANCE REQUIREMENTS. QUANTITY AND SIZE OF CONDUCTORS TO BE DETERMINED BY SIEMENS.
2. THE SYSTEM SHALL BE UL LISTED FOR FIRE (UL864) AND SUPPORT GAS ALARM EVENTS FOR CO DETECTION, PER NFPA 72.
3. PROVIDE AUXILIARY FIRE ALARM SIGNAL PANEL(S) W/ BATTERY BACKUP AS REQUIRED TO SUPPORT NOTIFICATION APPLIANCE LOADS.
4. ALL WIRING REQUIREMENTS SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.
5. PROVIDE END OF LINE RESISTERS AS NECESSARY.
6. ALL ADDRESSABLE SLC'S SHALL BE NFPA 72 CLASS B, STYLE 4.
7. ALL NOTIFICATION NAC'S SHALL BE NFPA 72 CLASS B, STYLE Y.
8. STROBE CANDELAS MUST BE SIZED PER NFPA 72 REQUIREMENTS BY THE FIRE ALARM VENDOR AND SHOWN ON THE SHOP DRAWINGS.
9. ALL PANEL BATTERY BACKUP (STANDBY & ALARM) SHALL BE SIZED PER NFPA 72 REQUIREMENTS.
10. A COMPLETE SET FOR FIRE ALARM PRODUCT CUTSHEETS, FIRE ALARM SHOP DRAWINGS, AND BATTERY/ VOLTAGE/ LOAD CALCULATIONS MUST BE SUBMITTED AND APPROVED PRIOR TO INSTALLATION.
11. PRIMARY FACP POWER FED VIA BRANCH CIRCUIT(S) DEDICATED FOR THE FIRE ALARM SYSTEM.
12. ALL EARTH GROUND PANEL CONNECTIONS REQUIRED BY THE MANUFACTURER SHALL BE CONNECTED TO THE BUILDING'S GROUND. PANEL NEUTRAL OR GROUNDING TO CONDUIT/ BUILDING STEEL NOT ACCEPTABLE.

ADDRESSABLE VOICE FIRE ALARM RISER DIAGRAM
NOT SCALE



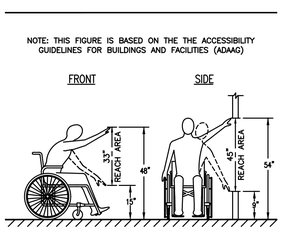
FIRE ALARM EQUIPMENT MOUNTING HEIGHTS DIMENSIONS

MANUAL PULL STATION MOUNTING HEIGHT REFERENCES

CODE	MINIMUM	MAXIMUM
NFPA-72	39"	54"
IBC	42"	48"
ADAAG	--	[4]48"

[4] THE MOST RESTRICTIVE FRONT REACH DISTANCE

NOTE: THIS FIGURE IS BASED ON THE THE ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES (ADAAG)



ADA WHEELCHAIR ACCESSIBILITY DIMENSIONS

HARMONIZED FIRE ALARM EQUIPMENT MOUNTING DISTANCE REQUIREMENTS - IBC/ADA/NFPA/ANSI
NOT TO SCALE--FOR INSTALLER'S REFERENCE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL FIRE ALARM LEAD SHEET

PROJECT TITLE:

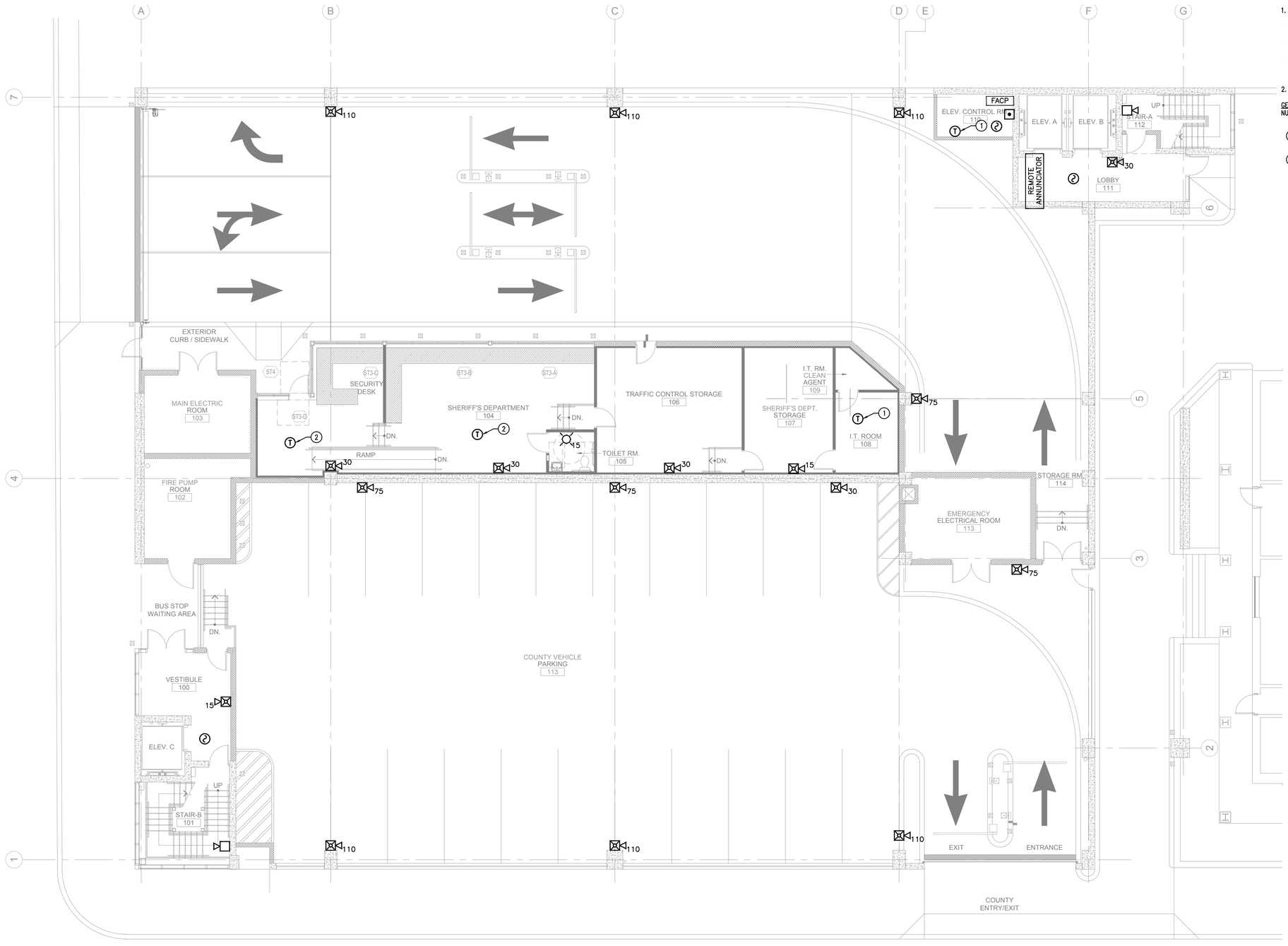
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FA-001



NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:
   - A. REFER TO FIRE ALARM SHEET FA-001 FOR PROJECT GENERAL NOTES, SYMBOL LEGEND, AND ABBREVIATIONS.
   - B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.
   - C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.

2. NEW WORK KEYED NOTES:

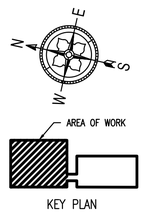
GENERAL: NEW WORK NOTES ARE INDICATED WITH THE FOLLOWING SYMBOL (-) AND ARE NUMBERED AS FOLLOWS:

(1) PROVIDE AND INSTALL NEW ENVIRONMENTAL TEMPERATURE SENSOR TIED INTO FIRE ALARM SYSTEM. SET HIGH TEMP NOTIFICATION FOR 85°F.

(2) PROVIDE AND INSTALL NEW ENVIRONMENTAL TEMPERATURE SENSOR TIED INTO FIRE ALARM SYSTEM. SET LOW TEMP NOTIFICATION FOR 55°F.

1 FA-101 — ELECTRICAL – NEW GARAGE FIRST FLOOR PLAN – FIRE ALARM
SCALE: 1/8"=1'-0"

SCALE BAR: 1/8"=1'-0" (0' 2' 4' 8' 16')



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE FIRST FLOOR PLAN - FIRE ALARM

PROJECT TITLE:

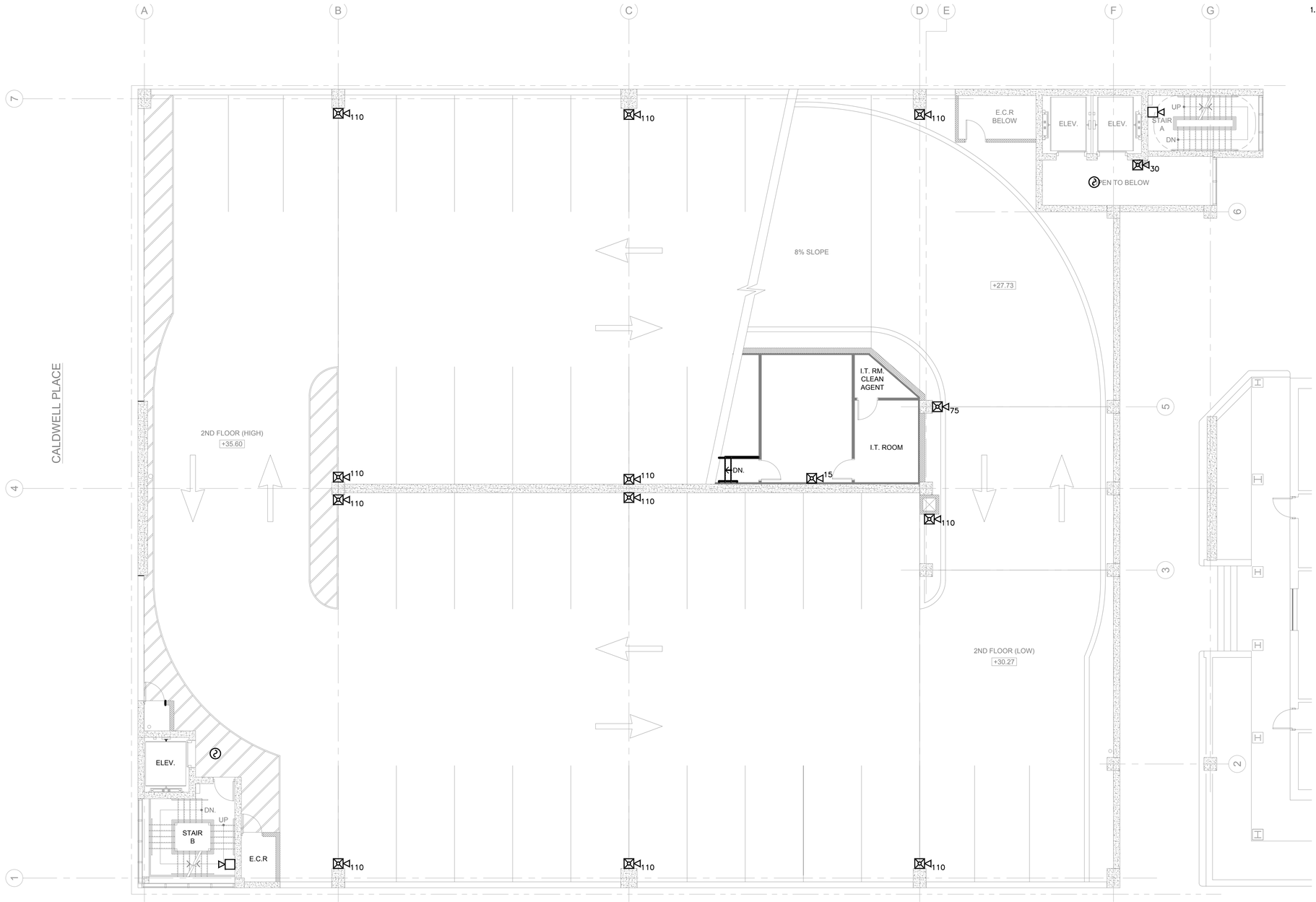
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FA-101



ELIZABETHTOWN PLAZA

1 FA-102 **ELECTRICAL – NEW GARAGE SECOND FLOOR PLAN – FIRE ALARM**

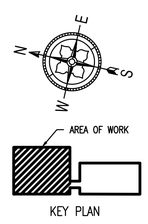
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:
   - A. REFER TO FIRE ALARM SHEET FA-001 FOR PROJECT GENERAL NOTES, SYMBOL LEGEND, AND ABBREVIATIONS.
   - B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.
   - C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE SECOND FLOOR PLAN - FIRE ALARM

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

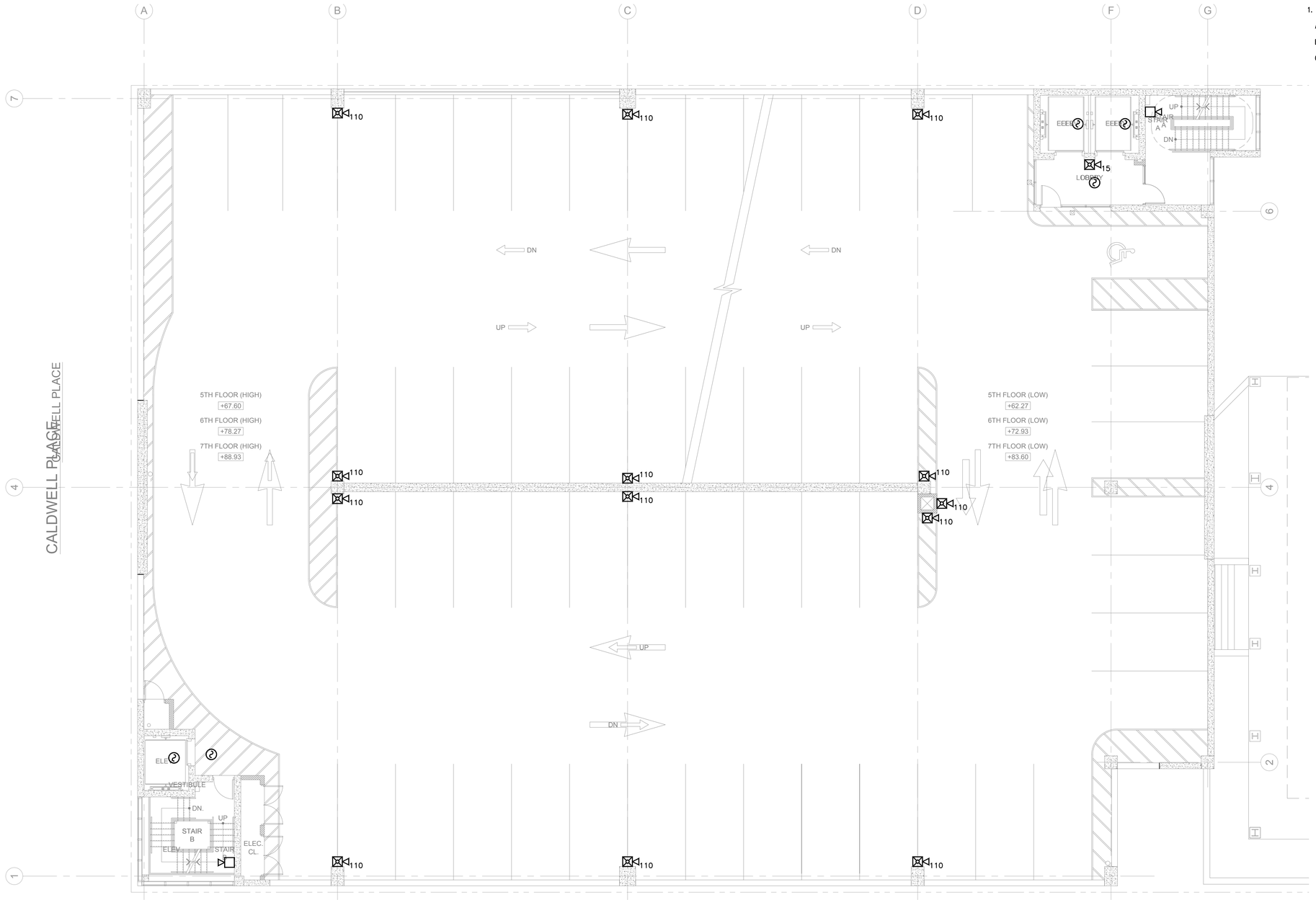
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

FA–102



ELIZABETHTOWN PLAZA

ELIZABETHTOWN PLAZA

1 FA-103 **ELECTRICAL – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN – FIRE ALARM**

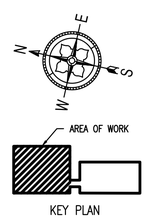
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:
   - A. REFER TO FIRE ALARM SHEET FA-001 FOR PROJECT GENERAL NOTES, SYMBOL LEGEND, AND ABBREVIATIONS.
   - B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.
   - C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA279367OO
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN - FIRE ALARM

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

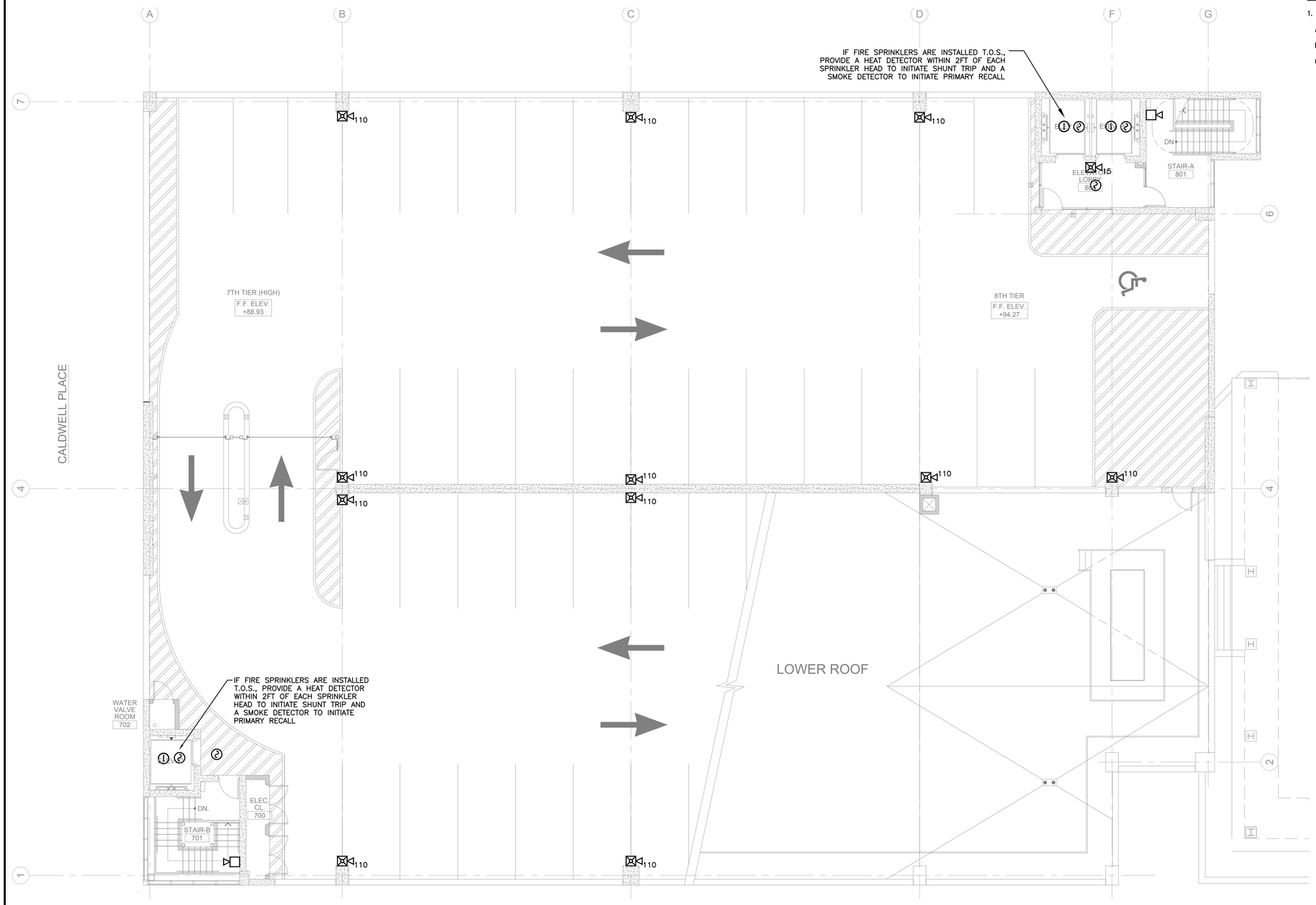
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

FA–103



ELIZABETHTOWN PLAZA

1 FA-104 ELECTRICAL – NEW GARAGE EIGHTH FLOOR PLAN – FIRE ALARM

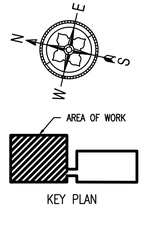
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'

SCALE BAR: 1/8"=1'-0"

NEW WORK SYSTEM NOTES:

1. GENERAL NOTES:
   - A. REFER TO FIRE ALARM SHEET FA-001 FOR PROJECT GENERAL NOTES, SYMBOL LEGEND, AND ABBREVIATIONS.
   - B. REFER TO BOOK SPECIFICATIONS FOR PROJECT DETAILS AND EXECUTION REQUIREMENTS.
   - C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE 2017 EDITION OF THE NATIONAL ELECTRICAL CODE.



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

ELECTRICAL - NEW GARAGE EIGHTH FLOOR PLAN - FIRE ALARM

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H

ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

FA–104

ABBREVIATIONS

ABV	ABOVE
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
AP	ACCESS PANEL
APPROX	APPROXIMATE
AVG	AVERAGE
BLDG	BUILDING
BV	BUTTERFLY VALVE
CA	COMPRESSED AIR
CLG	CEILING
COL	COLUMN
CON	CONCENTRIC
CONC	CONCRETE
CONT	CONTINUATION
CONTR	CONTRACTOR
DEPT	DEPARTMENT
DIA	DIAMETER
DIM	DIMENSION
DISCH	DISCHARGE
DIW	DOWN IN WALL
DN	DOWN
DWG	DRAWING
EA	EACH
(E)	EXISTING TO REMAIN
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRIC
EQUIV	EQUIVALENT
FAC	FIRE ALARM CONTRACTOR
FACP	FIRE ALARM CONTROL PANEL
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FIN	FINISHED FLOOR
FLR	FLOOR
FM	FACTORY MUTUAL
FP	FIRE PROTECTION
FPC	FIRE PROTECTION CONTRACTOR
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOW SWITCH
FSM	FIRE SERVICE MAIN
FT	FEET
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
HD	HEAD
HP	HORSEPOWER
HR	HOUR
HZ	HERTZ
MAX	MAXIMUM
MC	MECHANICAL CONTRACTOR
MED	MEDIUM
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
(N)	NEW
NTS	NOT TO SCALE
PD	PRESSURE DROP
PC	PLUMBING CONTRACTOR
PH	PHASE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
(R)	REMOVE EXISTING
RAC	RUN ABOVE CEILING
RAF	RUN ABOVE FLOOR
RBF	RUN BELOW FLOOR
RBG	RUN BELOW GRADE
RBR	RUN BELOW ROOF
RBS	RUN BELOW STEEL
(RE)	RELOCATE EXISTING
REQ	REQUIRED
RIW	RUN IN WALL
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
SPEC	SPECIFICATION
STD	STANDARD
STL	STEEL
SYS	SYSTEM
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
TS	TAMPER SWITCH
TYP	TYPICAL
UL	UNDERWRITER'S LABORATORY
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
W	WIDTH
W/O	WITHOUT
WC	WATER COLUMN
WG	WATER GAUGE

LINE DESIGNATIONS

SPM	SPRINKLER MAIN
FSM	FIRE SERVICE MAIN
DSM	DRY SYSTEM MAIN
DSP	DRY STANDPIPE
FDC	FIRE DEPARTMENT CONNECTION
CN2	COMPRESSED NITROGEN

FIRE PROTECTION SYMBOLS

- GATE VALVE
- BUTTERFLY VALVE
- BALL VALVE
- CHECK VALVE
- PIPE RISING UP
- PIPE DROPPING DOWN
- CAP
- NEW UPRIGHT HEAD
- NEW SIDEWALL HEAD
- NEW CONCEALED PENDANT HEAD
- ALARM CHECK VALVE AND TRIM
- FIRE DEPARTMENT CONNECTION (FDC)
- TS — TAMPER SWITCH
- ELECTRICALLY SUPERVISED HEAT TRACE

MISC. DWG. SYMBOLS

- POINT OF CONNECTION
- POINT OF DISCONNECT
- POINT OF CONNECTION FOR FUTURE WORK
- EQUIPMENT SYMBOL
- EQUIPMENT NUMBER OR FLOW (GPM,CFM,ETC.)
- DETAIL NUMBER
- DETAIL DRAWING NUMBER
- SECTION LETTER
- SECTION DRAWING NUMBER
- PLAN NUMBER
- PLAN DRAWING NUMBER
- KEYED DEMOLITION NOTE
- KEYED NEW WORK NOTE

HYDRANT FLOW INFORMATION

AVAILABLE WATER PRESSURE DATA

NJAWC HYDRANT TEST #5561
DATE: 06/26/2020
FLOW STREET: RAHWAY AVENUE
FLOW HYDRANT #: 27190
STATIC PRESSURE: 55 PSI
RESIDUAL PRESSURE: 50 PSI
FLOW: 1126 GPM

NOTES

THE FOLLOWING NOTES APPLY TO ALL "FP" FIRE PROTECTION DRAWINGS:

1. THE FIRE PROTECTION CONTRACTOR SHALL TERMINATE WORK 5'-0"OUTSIDE BUILDING. ALL OTHER WORK BY G.C. OR BY CIVIL/SITE CONTRACTOR.
2. ENTIRE INSTALLATION SHALL MEET THE REQUIREMENTS OF THE FOLLOWING:
   A. NFPA #13 2016 STATE ADOPTED EDITION.
   B. CITY OF ELIZABETH, COUNTY AND STATE BUILDING CODE REGULATIONS.
   C. INTERNATIONAL BUILDING CODE, 2018 NJ EDITION.
3. ALL SYSTEMS SHALL BE DESIGNED ON A HYDRAULICALLY CALCULATED BASIS BY THE FIRE PROTECTION CONTRACTOR. CALCULATIONS AND SHOP DRAWINGS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW JERSEY WHICH WILL BE SUBMITTED TO THE BUILDING CODE OFFICIAL FOR APPROVAL.
4. THE FIRE PROTECTION CONTRACTOR SHALL PREPARE ALL NECESSARY SHOP DRAWINGS AND HYDRAULIC CALCULATIONS BASED ON CONTRACTOR'S LAYOUT. SUBMISSION OF SPRINKLER SHOP DRAWINGS AND ASSOCIATED HYDRAULIC CALCULATION CONSTRUES AS EVIDENCE THAT SPRINKLER PIPING LAYOUT SHOWN INCLUDES ALL REQUIRED, ELEVATIONS, OFFSETS, RISERS COORDINATED WITH ALL PROJECT TRADES AND EXISTING BUILDING CONDITIONS.
5. THE FIRE PROTECTION CONTRACTOR SHALL MAKE ALL NECESSARY SUBMISSIONS (FEDERAL, STATE AND LOCAL AUTHORITIES) AND OBTAIN ALL NECESSARY PERMITS AND APPROVALS PRIOR TO STARTING FABRICATION AND CONSTRUCTION.
6. PRIOR TO STARTING SHOP DRAWINGS, THE FIRE PROTECTION CONTRACTOR SHALL OBTAIN A FLOW TEST ON THE WATER SUPPLY PERFORMED WITHIN THE LAST 12 MONTHS INDICATING STATIC PRESSURE AND INSTANTANEOUS GALLONS PER MINUTE (GPM) WITH RESULTANT RESIDUAL PRESSURE.
7. ALL EQUIPMENT, DEVICES AND MATERIALS USED IN THE INSTALLATION SHALL BE LISTED BY UNDERWRITER'S LABORATORY (UL) AND/OR APPROVED BY FACTORY MUTUAL (FM).
8. THE FIRE PROTECTION CONTRACTOR SHALL COORDINATE THE INSTALLATION OF THE ENTIRE SYSTEM WITH ALL BUILDING AND CEILING ELEMENTS INCLUDING, BUT NOT LIMITED TO, PIPING, DUCTWORK, DIFFUSERS, LIGHTING FIXTURES, ETC.
9. WHERE EXPOSED, THE SPRINKLER SYSTEM PIPING SHALL BE RUN PARALLEL AND/OR PERPENDICULAR TO STRUCTURAL ELEMENTS AS APPLICABLE.
10. PROVIDE SPRINKLER HEADS OVER AND UNDER DUCTWORK OR OTHER OBSTRUCTIONS 48" AND GREATER IN WIDTH.
11. PROVIDE ADDITIONAL SPRINKLER HEADS TO COMPLY WITH NFPA SPRINKLER COVERAGE, UNDERWRITER, LOCAL FIRE OFFICIAL, ETC., REQUIREMENTS ABOVE AND BEYOND THE MINIMUM QUANTITIES SPRINKLER HEAD SHOWN OR SPECIFIED.
12. SPRINKLER HEAD TYPES AND TEMPERATURE RATING SHALL BE BASED ON NFPA REQUIREMENTS FOR THE BUILDING CLASSIFICATION.
    A. LIGHT HAZARD OCCUPANCY: QUICK RESPONSE TYPE ORDINARY HAZARD: STANDARD RESPONSE OR QUICK RESPONSE TYPE. MIN. K FACTOR: 8.0, 7 PSI MIN DISCHARGE.
13. PROVIDE TAMPER SWITCHES FOR ALL OS&Y GATE VALVES AND INDICATING TYPE VALVES.
14. PROVIDE FLOW SWITCHES FOR EACH SPRINKLER ZONE.
15. PROVIDE TEST VALVES FOR EACH SPRINKLER ZONE.
16. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT ROOM LAYOUTS, ROOM DIMENSIONS, CEILING HEIGHTS, BUILDING CONSTRUCTION AND ALL OTHER ARCHITECTURAL AND STRUCTURAL DETAILS IMPACTING DESIGN.
17. DO NOT RUN PIPING OVER OR THROUGH ANY ELECTRICAL EQUIPMENT. UNLESS BRANCH LINE IS TO SERVE ROOM.
18. IT SHALL BE THE RESPONSIBILITY OF THE FIRE PROTECTION CONTRACTOR TO COORDINATE WITH THE ELECTRICAL CONTRACTOR DURING CONSTRUCTION TO IDENTIFY AND LOCATE ON THE CONTRACT DRAWINGS THE LOCATION AND POWER REQUIREMENTS FOR ALL EQUIPMENT AND COMPONENTS RELATED TO THE SPRINKLER SYSTEM.
19. THE BUILDING SHALL BE PROVIDED WITH SPRINKLER COVERAGE AS INDICATED ON THE DRAWINGS, INCLUDING, BUT NOT LIMITED TO, UNDERSIDE OF ROOF, ABOVE CEILING AND OTHER CONCEALED SPACES, WHERE COMBUSTIBLES ARE PRESENT, IN ACCORDANCE WITH NFPA 13 AND THE AUTHORITY HAVING JURISDICTION. REFER TO ARCHITECTURAL PLANS, ROOM FINISH SCHEDULE AND OTHER CONTRACT DRAWINGS.
20. ALL OFFICE AND VESTIBULE AREAS – LIGHT HAZARD. THE MINIMUM DESIGN DENSITY SHALL BE 0.10 GPM/SQ.FT. OVER THE MOST REMOTE 1500 SQ.FT OR 1,950 SQ.FT. WHERE SERVED FROM THE DRY PIPE SYSTEM. PLUS 100 GPM HOSE ALLOWANCE.
21. ALL GARAGE AND STORAGE SPACES – ORDINARY HAZARD GROUP 1. THE MINIMUM DESIGN DENSITY SHALL BE 0.15 GPM/SQ.FT. OVER THE MOST REMOTE 1,950 SQ.FT. PLUS 250 GPM HOSE ALLOWANCE.
22. ALL PIPING AND EQUIPMENT SHALL BE SEISMICALLY SUPPORTED AND COMPLY WITH THE INTERNATIONAL BUILDING CODE SEISMIC FACTORS FOR THE BUILDING'S LOCATION. REFER TO SPECIFICATION AND WITH NFPA 13 REQUIREMENTS FOR HANGING, BRACING AND RESTRAINTS.
23. COORDINATE FLOW SWITCH, TAMPER SWITCH, AND ALL OTHER ALARM DEVICE LOCATIONS AND QUANTITIES WITH FIRE ALARM CONTRACTOR.
24. SPRINKLER NEAR HEAT SOURCES SHALL BE PROVIDED IN ACCORDANCE TO NFPA 13 WITH RESPECT TO TEMPERATURE RATING AND LOCATION.
25. THE FIRE PROTECTION CONTRACTOR SHALL PROVIDE SPRINKLER HEADS FOR COVERAGE AS OUTLINED PER NFPA 13 REQUIREMENTS AND SHALL BE INSTALLED IN CENTER OF TILE IN A SYMMETRICAL AND ORDERLY FASHION COORDINATED WITH ALL CEILING DEVICES (I.E. DIFFUSERS. LIGHTS , SMOKE DETECTORS, ETC.)
26. SPRINKLER SYSTEM PIPING: SCHEDULE 10 W/ GROOVED LOCKED FITTING: 2-1/2" & LARGER SCREWED FITTING: 2" AND SMALLER
27. COORDINATE ALL FIRE PROTECTION DEMOLITION AND NEW WORK WITH PHASING NOTES ON ARCHITECTURAL DRAWING A-007.

DRAWING LIST

UNION COUNTY PARKING GARAGE

SHEET NO.	DRAWING NUMBER	DRAWING TITLE	DATE	ISSUE: ISSUED FOR BIDDING		
				07/28/2021		
		FIRE PROTECTION				
1	FP-001	FIRE PROTECTION LEAD SHEET		X		
2	FP-101	FIRE PROTECTION - NEW GARAGE FIRST FLOOR PLAN		X		
3	FP-102	FIRE PROTECTION - NEW GARAGE SECOND FLOOR PLAN		X		
4	FP-103	FIRE PROTECTION - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN		X		
5	FP-104	FIRE PROTECTION - NEW GARAGE EIGHTH FLOOR PLAN		X		
6	FP-105	FIRE PROTECTION - NEW GARAGE ROOF PLAN		X		
7	FP-400	FIRE PROTECTION SCHEDULES, DETAILS, & DIAGRAMS		X		

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION LEAD SHEET

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

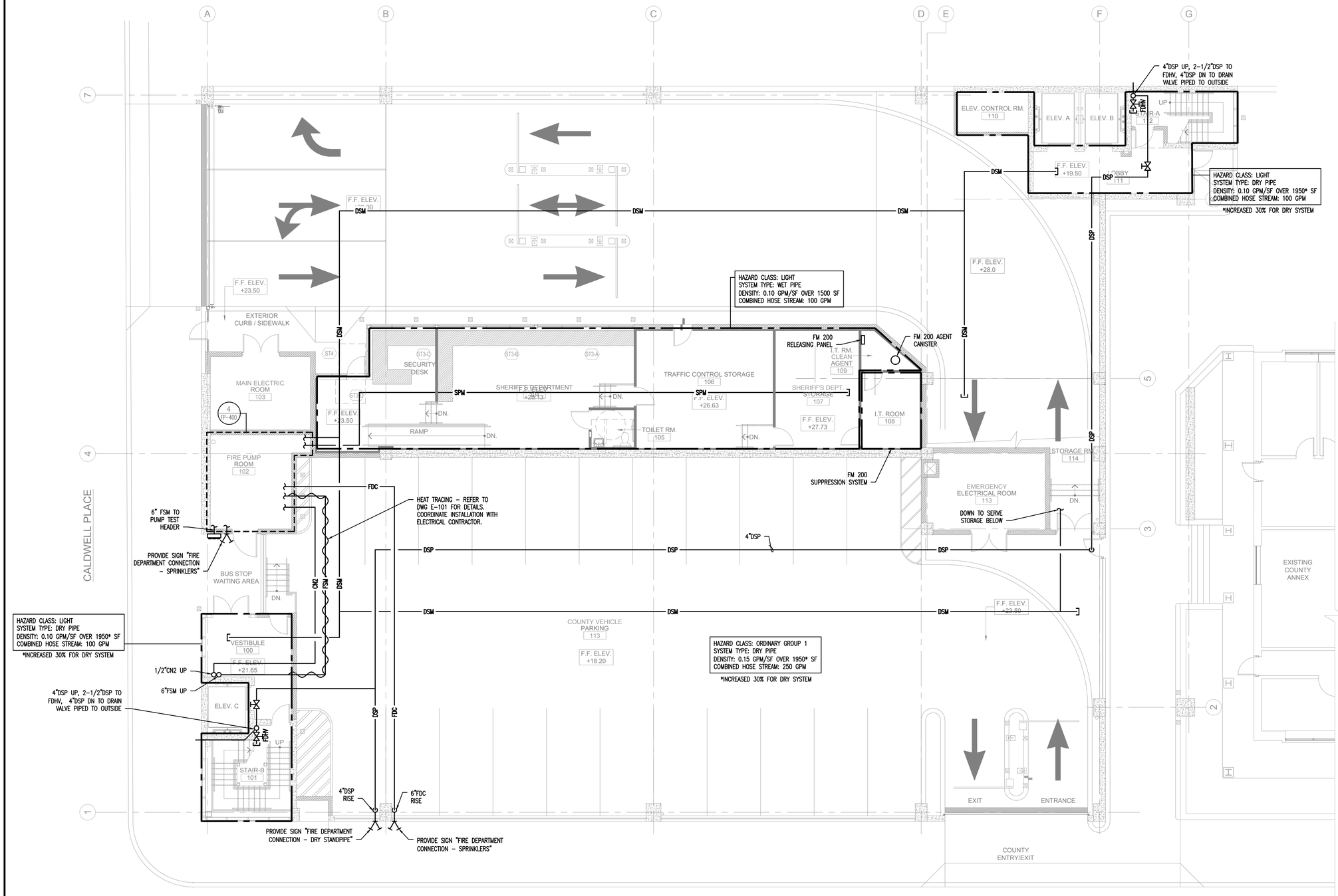
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

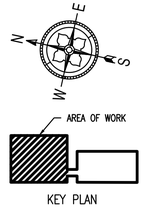
FP-001



ELIZABETHTOWN PLAZA

1 FP-101 **FIRE PROTECTION – NEW GARAGE FIRST FLOOR PLAN**
SCALE: 1/8"=1'-0"

0' 2' 4' 8' 16'
SCALE BAR: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION - NEW GARAGE FIRST FLOOR PLAN

PROJECT TITLE:

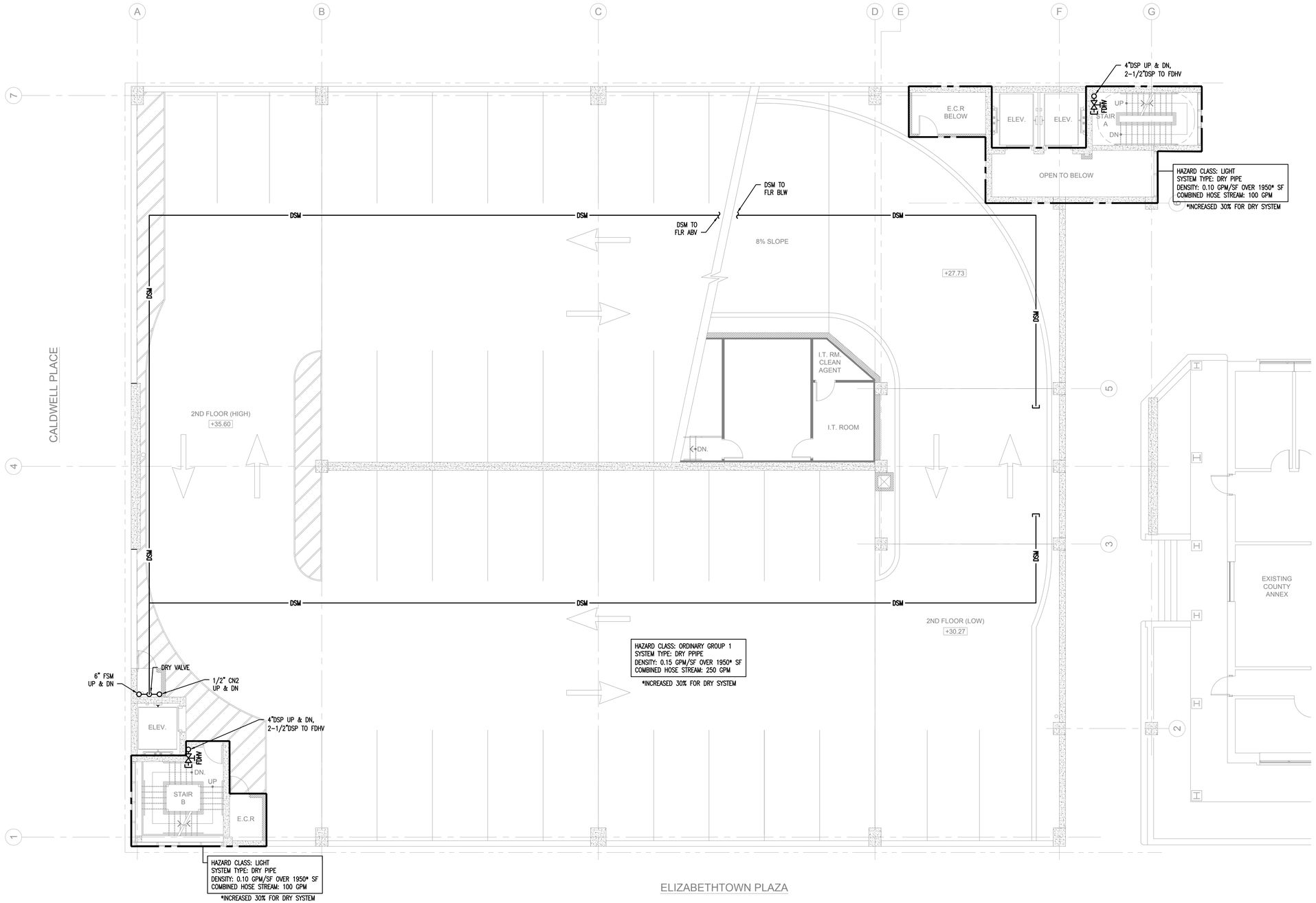
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

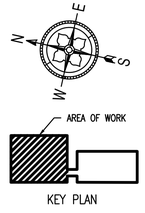
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FP–101



1 FP-102 **FIRE PROTECTION – NEW GARAGE SECOND FLOOR PLAN**
SCALE: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION - NEW GARAGE SECOND FLOOR PLAN

PROJECT TITLE:

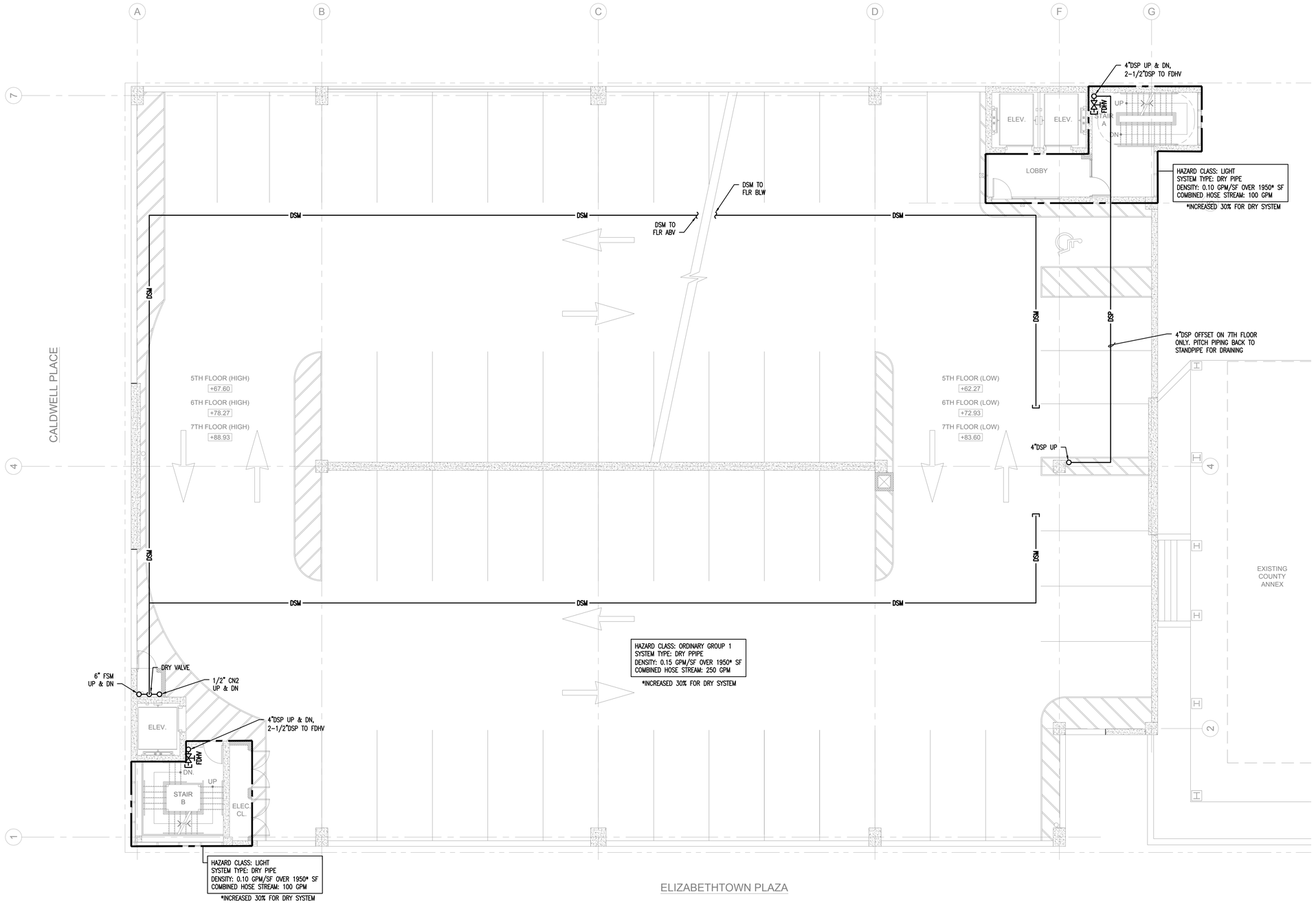
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

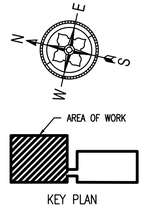
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FP–102



1 FP-103 **FIRE PROTECTION – NEW GARAGE THIRD TO SEVENTH FLOOR PLAN**
SCALE: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION - NEW GARAGE THIRD TO SEVENTH FLOOR PLAN

PROJECT TITLE:

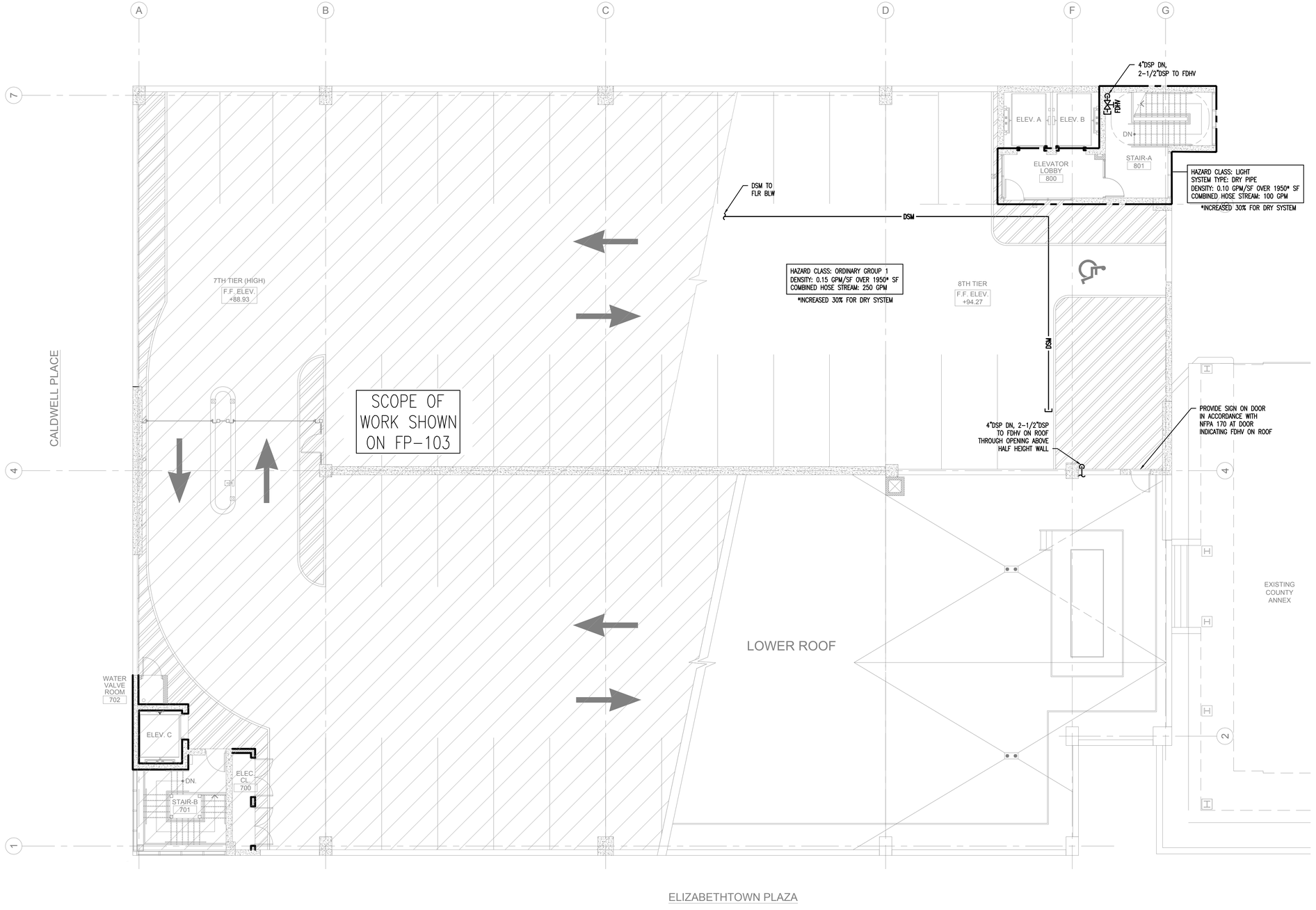
UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

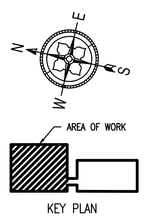
DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FP–103



1 FP-104 **FIRE PROTECTION – NEW GARAGE EIGHTH FLOOR PLAN**
SCALE: 1/8"=1'-0"



KEY PLAN

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION -
NEW GARAGE
EIGHTH FLOOR PLAN

PROJECT TITLE:

UNION COUNTY
PARKING GARAGE
BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

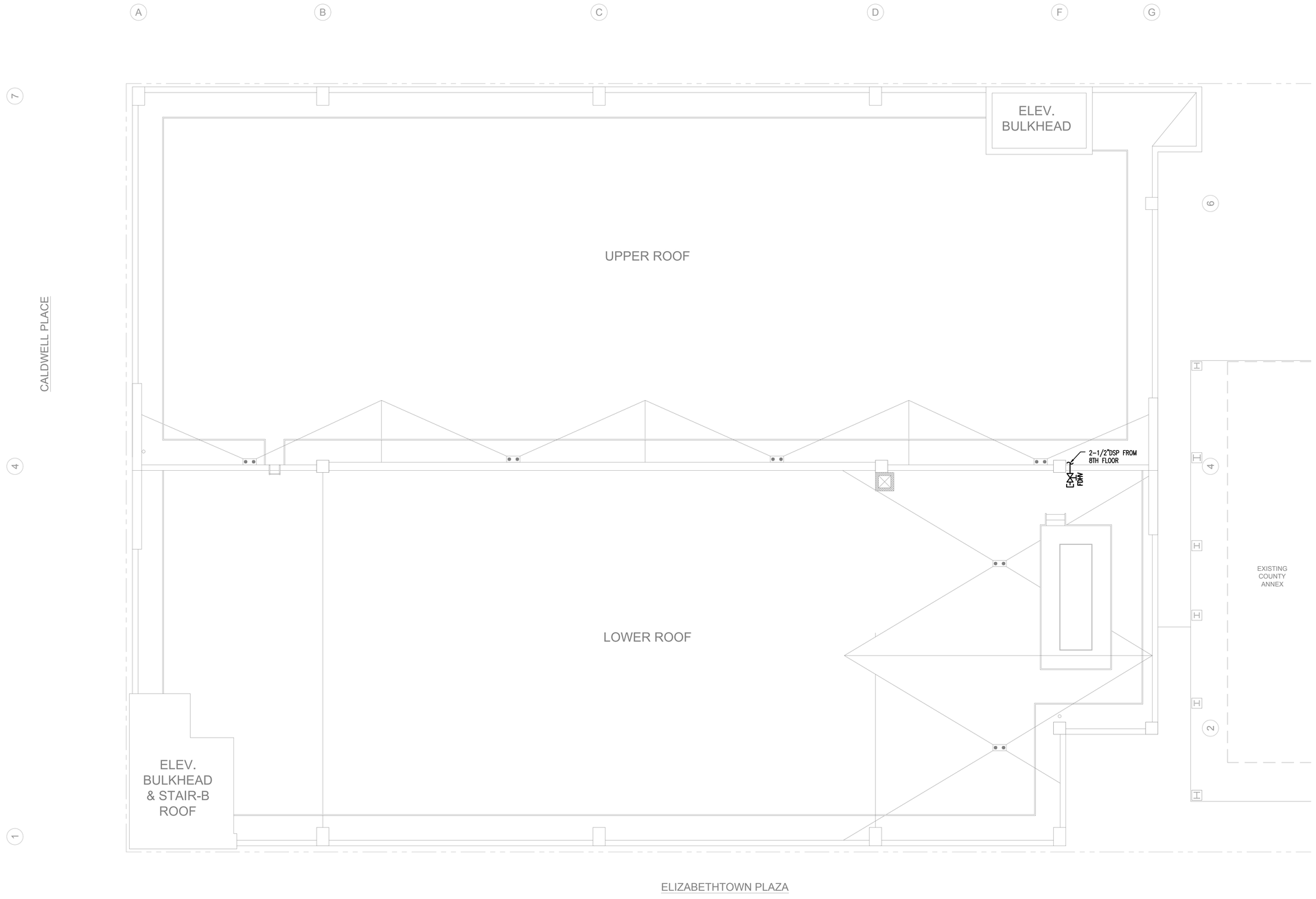
SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

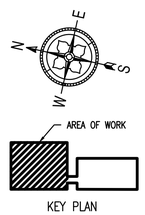
Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.

FP-104



1 FP-105 **FIRE PROTECTION – ROOF PLAN**
SCALE: 1/8"=1'-0"



NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006
FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION - ROOF PLAN

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FP–105

PUMP SCHEDULE

FP 1 / JP 1

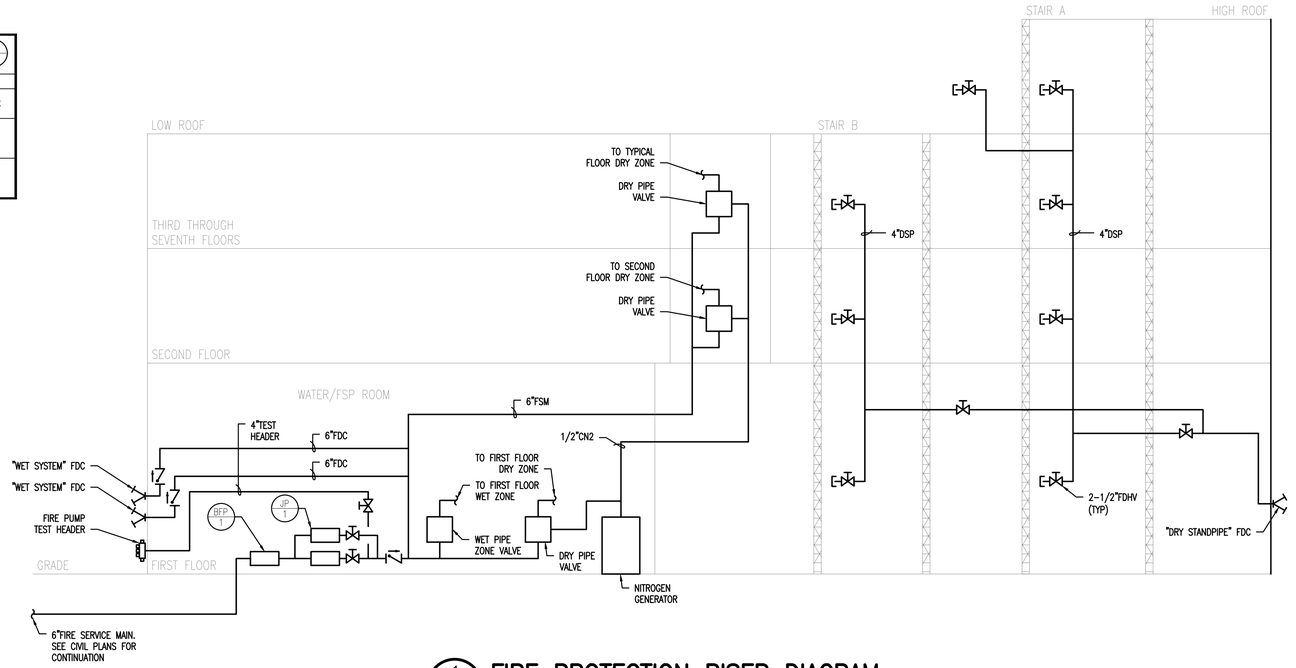
SYMBOL	SERVICE	LOCATION	TYPE	GPM	PSI	RPM	MOTOR HP	# OF STAGES	ELECTRICAL V/PH/HZ	OPER WEIGHT (LBS)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER
FP-1	FP	WATER/FSP ROOM	VERTICAL IN-LINE	500	85	3550	40	1	460/3/60	670	AC FIRE PUMP	1580 SERIES 6X6X9.5F
JP-1	FP	WATER/FSP ROOM	SUMP PUMP	5	108	3500	1	9	460/3/60	66	AC FIRE PUMP	1SV

BACKFLOW PREVENTER SCHEDULE

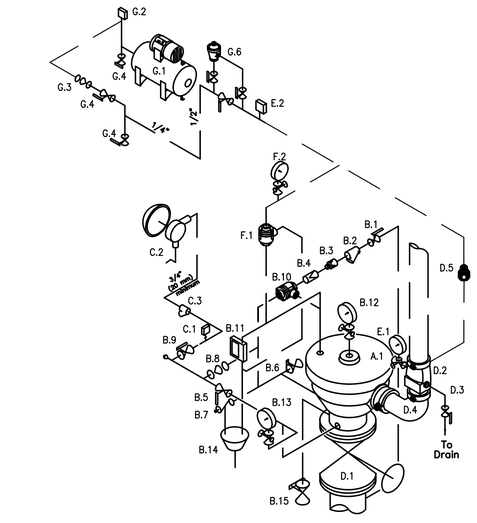
BFP 1

SYMBOL	SERVICE	LOCATION	TYPE	SIZE	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
BFP-1	FIRE PROTECTION	WATER/FSP ROOM	DCDA	6"	AMES	3000SS	-

INSTALL BACKFLOW PREVENTERS BETWEEN 12" AND 60" ABOVE FINISHED FLOOR



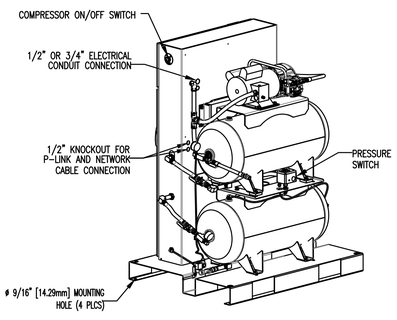
1 FP-400 **FIRE PROTECTION RISER DIAGRAM**
SCALE: NONE

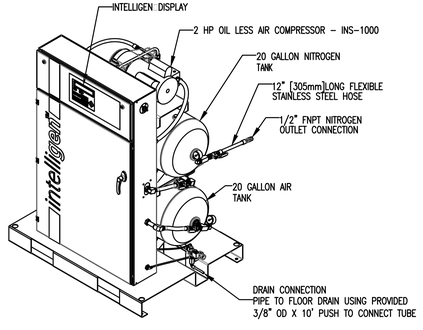


SYSTEM COMPONENTS
A. VALVE
  A.1 DELUGE VALVE
B. DELUGE VALVE EASY TRIM
  B.1 PRIMING VALVE (NORMALLY OPEN)
  B.2 STRAINER
  B.3 1/16" RESTRICTED ORIFICE
  B.4 SPRING LOADED CHECK VALVE
  B.5 ALARM TEST VALVE (NORMALLY CLOSED)
  B.6 AUXILIARY DRAIN VALVE (NORMALLY CLOSED)
  B.7 DRIP CHECK VALVE
  B.8 DRAIN CHECK VALVE
  B.9 ALARM SHUT-OFF VALVE (NORMALL OPEN)
  B.10 PRESSURE SHUT-OFF VALVE (PSOV)
  B.11 EMERGENCY RELEASE
  B.12 PRIMING PRESSURE WATER GAUGE AND VALVE
  B.13 WATER SUPPLY PRESSURE GAUGE AND VALVE
  B.14 DRAIN CUP
  B.15 FLOW TETS VALVE (NORMALLY CLOSED)
C. WATER FLOW ALARM EQUIPMENT
  C.1 ALARM PRESSURE SWITCH
  C.2 WATER MOTOR ALARM (STRAINER REQUIRED)
  C.3 STRAINER
D. RISER
  D.1 WATER SUPPLY CONTROL VALVE
  D.2 EASY RISER CHECK VALVE OR RUBBER SEATED CHECK VALVE
  D.3 SPRINKLER SYSTEM MAIN DRAIN
  D.4 90 ELL (GROOVED ELL SHOWN. DELUGE VALVE ALSO AVAILABLE WITH FLANGED OUTLET
  D.5 FLOAT CHECK
E. SUPERVISORY AIR SUPPLY
  E.1 SYSTEM PRESSURE GAUGE AND VALVE
  E.2 AIR PRESSURE SUPERVISORY SWITCH
F. RELEASE SYSTEM
  F.1 ANTI-FLOOR ASSEMBLY
  F.2 AIR PRESSURE GAUGE AND VALVE
G. AIR SUPPLY
  G.1 AUTOMATIC AIR SUPPLY. REFER TO 3/FP-400 FOR ADDITIONAL INFORMATION.
  G.2 AIR SUPERVISORY PRESSURE SWITCH (COMPRESSOR ON/OFF CONTROL SWITCH)
  G.3 SOFT SEAT CHECK VALVE
  G.4 SHUT-OFF VALVE
  G.5 AIR MAINTENANCE DEVICE & BY-PASS TRIM

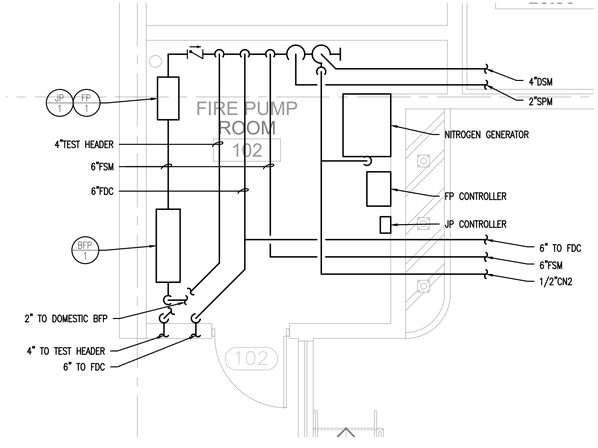
—— —— DASHED LINES INDICATE PIPE REQUIRED BUT NOT LISTED IN "SYSTEM COMPONENTS" TABLE.

2 FP-400 **DETAIL – DRY PIPE VALVE ASSEMBLY**
SCALE: NONE





3 FP-400 **DETAIL – NITROGEN GENERATOR ASSEMBLY**
SCALE: NONE
NOTES: BOD INS-1000 BY POTTER



4 FP-400 **ENLARGED PLAN – FIRE PUMP ROOM**
SCALE: NONE

NettaArchitects
1084 Route 22 West, Mountainside, New Jersey 07092
TEL: 973.379.0006 FAX: 973-379-1061

John A. Marchiafava P. E.
New Jersey P. E. No. 24GE04992500

Professional Engineer
John A. Marchiafava P. E.

CONCORD ENGINEERING
NJ COA: 24GA27936700
520 South Burnt Mill Road
Voorhees, New Jersey 08043
(856) 427-0200
www.concord-engineering.com

SHEET CONTENTS:

FIRE PROTECTION SCHEDULES, DETAILS, AND DIAGRAMS

PROJECT TITLE:

UNION COUNTY PARKING GARAGE BUILDING - H
ELIZABETHTOWN PLAZA
ELIZABETH NJ, 07202

SUBMISSION:
ISSUE FOR BIDDING

DATE	REVISIONS	BY	CHKD

Date	07.28.2021
Scale	AS SHOWN
Drawn by	CEG
Checked by	CEG
Job No.	8C20305.00

Drawing No.
FP–400