



# COUNTY OF UNION

DEPARTMENT OF ENGINEERING, PUBLIC WORKS & FACILITIES MANAGEMENT  
*Joseph A. Graziano Sr., Director*

## MEMORANDUM

**BOARD OF  
COUNTY COMMISSIONERS**

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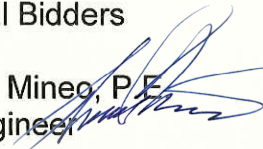
AMY C. WAGNER  
*Deputy County Manager*

BRUCE H. BERGEN, ESQ.  
*County Counsel*

JAMES E. PELLETTIERE, RMC  
*Clerk of the Board*

THOMAS O. MINEO, P.E.  
*County Engineer,  
Director, Division of Engineering*

**TO:** All Potential Bidders

**FROM:** Thomas O. Mineo, P.E.  
County Engineer 

**DATE:** April 8, 2021

**RE:** **CLARIFICATION - NUMBER 1**  
Union County Dispatch Center Expansion,  
Froehlich Building,  
Town of Westfield, County of Union,  
New Jersey BA# 27-2021; Union County  
Engineering Project # 2019-025

This is a response to questions received for the above referenced project.

**Question 1:** Fire Alarm system. In review the fire alarm system for this project is to add to a Siemen's MXL panel. As this is a propriety panel we will not be able to add. Believe the MXL panel is an obsolete panel. Do you want to replace with an EST?

**Response 1:** The fire alarm panel in the Froehlich building can be retrofitted through the use of a switch to accommodate the needs of this project as per our fire alarm vendor. Union County plans to upgrade the existing panel at some point in the future under separate contract.

**Question 2:** In reference to the above bid package we are missing a referenced drawing - FP-201. Please advise.

**Response 2:** There are only (3) fire drawings per the Table of Contents, F-001, F-101 & F-901. Disregard note referring to F-201 on F-102. Refer to Project Specifications.

**DIVISION OF ENGINEERING**



# COUNTY OF UNION

DEPARTMENT OF ENGINEERING, PUBLIC WORKS & FACILITIES MANAGEMENT

*Joseph A. Graziano Sr., Director*

## BOARD OF COUNTY COMMISSIONERS

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*Clerk of the Board*

THOMAS O. MINEO, P.E.  
*County Engineer,  
Director, Division of Engineering*

**Question 3:** Please provide complete contact information, including name, e-mail address & phone#, for the fire alarm vendor / servicing company for this building.

**Response 3:**

**Steve Drabik**

DavEd Fire Systems, Inc.  
307 West Pleasantview Ave.  
Hackensack, NJ 07601  
Tel: 201/342-7800

**Christopher Edgeworth**

*Business Development Manager-Fire*  
Siemens Industry, Inc.  
Building Technologies  
8 Fernwood Road  
Florham Park, NJ 07932  
Mobile: 973.445.0341  
Direct: 973.396.4232  
Email: [Christopher.edgeworth@siemens.com](mailto:Christopher.edgeworth@siemens.com)

**Question 4:** Is NOVEC 1230 dualflex an acceptable alternative to 2 separate system for this project?

**Response 4:** The Novec/Pre-action dual system is acceptable to use providing that it can be setup for pre-action and pre-action/clean agent spaces and proposed location will have a drain nearby.

## DIVISION OF ENGINEERING

2325 South Avenue

Scotch Plains, NJ 07076

(908)789-3675

fax(908)789-3674

[www.ucnj.org](http://www.ucnj.org)

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**SPECIFICATIONS  
FOR  
Union County Dispatch Center,  
Froehlich Building,  
Town of Westfield, County of Union,  
New Jersey**

**BA# 27-2021 Union County Engineering Project # 2019-025**

**March 2021**

**UNION COUNTY OFFICIALS  
BOARD OF COUNTY COMMISSIONERS**

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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:**  
PS&S

**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 **April 13, 2021 at 11:30 a.m.**, prevailing time, in the **3<sup>rd</sup> Floor Conference Room**, U.C. Administration Building, 10 Elizabethtown Plaza, Elizabeth, New Jersey for:

**Union County Dispatch Center Expansion, Froehlich Building,  
Town of Westfield, County of Union, New Jersey  
BA# 27-2021; Union County Engineering Project # 2019-025**

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) or #CO09 (General Construction/Alterations & Additions). In addition to #CO08 or #CO09, the following classifications shall also be required: #C029 (Structural Steel & Ornamental Iron Works), #C030 (Plumbing), #C032 (HVAC/R), #C045 (Sprinkler System), and #C047 (Electrical). 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.

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**

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***Union County Board of County Commissioners***  
***We're Connected to You!***



**Union County Dispatch Center, Froehlich Building,  
Town of Westfield, County of Union, New Jersey  
BA# 27-2021; Union County Engineering Project # 2019-025**

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## **STANDARD SPECIFICATION FORM - SS-1**

**STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR AIA DOCUMENT A-101/2007**  
(Draft form until contract is awarded)

**GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A-201/2007**  
(Draft form until contract is awarded)

## **NEW JERSEY PREVAILING WAGE DETERMINATION DOCUMENTS**

## **PROJECT TECHNICAL SPECIFICATIONS**

**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, 6<sup>th</sup> Floor  
10 Elizabethtown Plaza  
Elizabeth, New Jersey 07207

**ADDRESS INQUIRIES TO:**

Union County Division of Purchasing  
UC Administration Building, 3<sup>rd</sup> 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](mailto:ucbids@ucnj.org)

**ADDRESS BIDS AND SUBMIT TO:**

Union County Division of Purchasing  
UC Administration Building, 3<sup>rd</sup> 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](mailto:ucbids@ucnj.org)

**TITLE OF PROJECT: Union County Dispatch Center, Froehlich Building,  
Town of Westfield, County of Union, New Jersey  
BA# 27-2021; Union County Engineering Project # 2019-025**

**BIDDER: Bidder shall be a single overall contract bidder**

**ENGINEER: PS & S**

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

**COUNTY ENGINEER:**

Thomas O. Mineo, P.E.  
Union County  
Division of Engineering

**CONSTRUCTION MANAGER:**

## 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.

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 Contractor's risk. Such payment will only be in the amount agreed to by the parties, in writing in the Change Order(s). See Section 37, 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 minor informalities or non-material exceptions in the bids.

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 Assistant Director, Division of Purchasing at [ucbids@ucnj.org](mailto:ucbids@ucnj.org) 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 Assistant Director, Division of Purchasing at [ucbids@ucnj.org](mailto:ucbids@ucnj.org), 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 Office of the Division of Purchasing 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 Assistant Director, Division of Purchasing 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 15 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 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 will return all certified checks or cashier's checks after the proposals have been opened, tabulated and reviewed except those of the three (3) bidders lowest responsible bidders. 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 an 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. 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.

## **11. 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 non-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.

## **12. 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.”

## **13. 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.

## **14. 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".

## **15. 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.

## **16. 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.

## **17. 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.

## **18. OWNERSHIP DISCLOSURES REQUIRED**

Pursuant to P.L. 2016, c. 43, codified as N.J.S.A. 52:25-24.2.no corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies the County unless prior to the receipt of the bid or accompanying the bid, of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own ten percent (10%) or more of its stock, of any class, or of all individual partners in the partnership who own a ten percent (10%) or greater interest therein, or of all members in the limited liability company who own a ten percent (10%) or

greater interest therein, as the case may be. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding ten percent (10%) or more of that corporation's stock, or the individual partners owning ten percent (10%) or greater interest in that partnership, or the members owning ten percent (10%) or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every non corporate stockholder, and individual partner, and member, exceeding the ten percent (10%) ownership criteria has been listed.

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a ten percent (10%) or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission ("SEC") or the foreign equivalent, and, if there is any person that holds a ten percent (10%) or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal SEC or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a ten percent (10%) or greater beneficial interest.

(See forms attached)

#### **19. 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.

#### **20. 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.

#### **21. 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 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 procedures established by Resolution No. 2014-0408 adopted by the Union County Board of County Commissioners on May 8, 2014. The resolution is furnished in Section 51 of these General Specifications.

#### UNION LABOR IS PREFERRED ON ALL COUNTY WORK

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 statutes 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)

## **22. 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.

### **23. 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.

### **24. 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.

### **25. 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.

## **26. 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.

## **27. 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.

## **28. 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.

## **29. 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.

### 30. 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.

### 31. SUB-LETTING OF WORK

Except for the List of Subcontractors, pursuant to N.J.S.A. 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.

### 32. 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 shall be observed.

### **33. 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.

### **34. 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.

### **35. PERMITS**

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

### **36. 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.

### **37. CHANGE ORDERS**

The applicability of change orders and change order procedures shall comply with *N.J.S.A. 40A:11-16.7* and *N.J.A.C. 5:30-11.1 et seq.*, "Change Orders and Open End Contracts".

### **38. 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 36. 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.

### **39. FORM OF CONTRACT**

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.

### **40. 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 6 of these general specifications); **b)** Certification of Compliance, New Jersey Prevailing Wage Act (see Sections 21 and 51); and **c)** General Release (see Section 36) 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.

#### **41. 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.

#### **42. 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.

#### **43. 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.

## **44. 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. 17:27-7.2; 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. 17:27-7.2. 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:

(1) 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 contractor 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 10 of the Administrative Code (NJAC 17:27)**.

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#### 45. INVESTMENT ACTIVITIES IN IRAN

Pursuant to *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.

#### 46. 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.

#### 47. 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.

#### **48. 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.



#### **49. 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.

#### **50. 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.

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## 51. CONTRACTOR BUSINESS REGISTRATION CERTIFICATE

Pursuant to N.J.S.A. 52:32-44, the County of Union is prohibited from entering into a contract with an entity unless the bidder/proposer/contractor, and each subcontractor that is required by law to be named in a bid/proposal/contract has a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury.

Prior to contract award or authorization, the contractor shall provide the County of Union with its proof of business registration and that of any named subcontractor(s).

Subcontractors named in a bid or other proposal shall provide proof of business registration to the bidder, who in turn, shall provide it to the County of Union prior to the time a contract, purchase order, or other contracting document is awarded or authorized.

During the course of contract performance:

- 1) the contractor shall not enter into a contract with a subcontractor unless the subcontractor first provides the contractor with a valid proof of business registration.
- 2) the contractor shall maintain and submit to the County of Union a list of subcontractors and their addresses that may be updated from time to time.
- 3) the contractor and any subcontractor providing goods or performing services under the contract, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury, 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 the State. Any questions in this regard can be directed to the Division of Taxation at (609)292-6400. Form NJ-REG can be filed online at <http://www.state.nj.us/treasury/revenue/busregcert.shtml>.

Before final payment is made under the contract, the contractor shall submit to the County of Union a complete and accurate list of all subcontractors used and their addresses.

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration as required, or that provides false business registration information, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000, for each proof of business registration not properly provided under a contract with a contracting agency.

## **52. 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.

## **53. 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.

## **54. 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.

## **55. 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.

## **56. 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," (N.J.S.A. 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  
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.

**BIDDER'S NAME:** \_\_\_\_\_

\_\_\_\_\_ 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.

\_\_\_\_\_ 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 and Workforce and Workforce Development – 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

\_\_\_\_\_ 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**

**BIDDER'S NAME:** \_\_\_\_\_

**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)**
- **SPECIFICATIONS:** 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 Dispatch Center, Froehlich Building,  
Town of Westfield, County of Union, New Jersey  
BA# 27-2021; Union County Engineering Project # 2019-025**

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.

**LUMP SUM BASE BID:**

\_\_\_\_\_  
Written

\_\_\_\_\_  
Figures

**A. BID CONTINGENCY ALLOWANCE: (To be used if and when directed by the County)**

Three Hundred and Fifteen Thousand Dollars  
Written

\$ 315,000.00  
Figures

**B. 3<sup>rd</sup> PARTY TESTING & INSPECTION ALLOWANCE:**

Five Thousand Dollars  
Written

\$ 5,000.00  
Figures

**C. MILLWORK, FURNITURE & LOCKER ALLOWANCE:**

One Hundred and Sixty Thousand Dollars  
Written

\$ 160,000.00  
Figures

**TOTAL LUMP SUM BASE BID PLUS ALLOWANCES AMOUNT:**

\_\_\_\_\_  
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):

BIDDER'S NAME: \_\_\_\_\_

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.**

BIDDER'S NAME: \_\_\_\_\_

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](http://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 not 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 registered 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 352  
TRENTON, NJ 08646

TAXPAYER NAME: TAX REG TEST ACCOUNT  
TRADE NAME: TAX REG TEST ACCOUNT  
TAX REGISTRATION TEST ACCOUNT  
CLIENT REGISTRATION  
TAXPAYER IDENTIFICATION: 010-007-382000  
SEQUENCE NUMBER: 0107200  
ADDRESS: 847 ROEBLING AVE  
TRENTON, NJ 08611  
ISSUANCE DATE: 07/14/04  
EFFECTIVE DATE: 01/01/01

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:** \_\_\_\_\_

**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 and Workforce and Workforce Development. 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 and Workforce and Workforce Development  
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](mailto: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 U.S.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 thereto, 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.

<b>Individual's Name</b>	<b>Present Position or Office</b>	<b>Yrs. of Construction Experience</b>	<b>Magnitude &amp; Type of Work</b>	<b>In What Capacity</b>

**BIDDER'S NAME:** \_\_\_\_\_

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.**

**BIDDER'S NAME:** \_\_\_\_\_

**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:** \_\_\_\_\_

**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.

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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.

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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.

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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 contract for goods or services with a public entity?

\_\_\_\_\_ yes                      \_\_\_\_\_ no    If yes, please provide full, detailed explanation.

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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 \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_

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:** \_\_\_\_\_

**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 **Three Hundred and Thirty (330) 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.

# DRAFT AIA Document A101™ - 2007

## 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 County Engineer or his designee:  
(Name, legal status, address and other information)

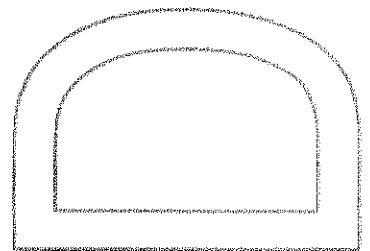
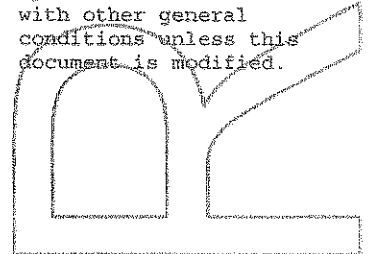
The Owner and Contractor agree as follows.



**ADDITIONS AND DELETIONS:**  
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

AIA Document A201™-2007, 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.

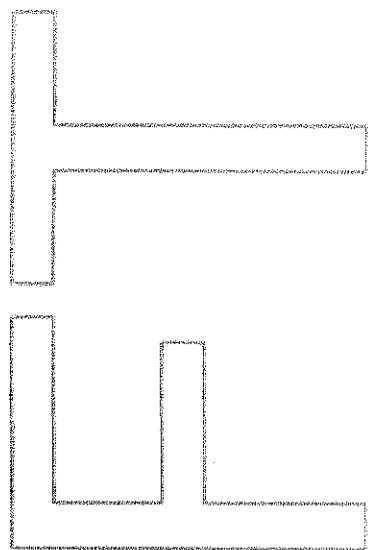


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TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
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- 4 CONTRACT SUM
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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. The Contractor will not be compensated for labor or materials outside the scope of work that is not properly authorized.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a Notice to proceed issued by the Owner, which is anticipated to be on or about

((( )))

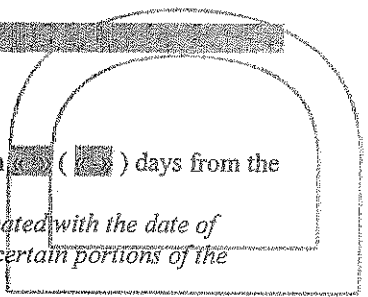
If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows: Not applicable.

((( )))

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

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than ( ) days from the date of commencement, or as follows:

*(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)*



Portion of Work

Substantial Completion Date

Entire Work

TBD

, subject to adjustments of this Contract Time as provided in the Contract Documents.

*(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)*

« » Should the Contractor fail to complete fully, and in conformity with all provisions of the Contract within the Contract Time, the Contractor shall, and hereby agrees to pay the Owner One Thousand Dollars (\$1,000.00) per day for as liquidated damages, for each consecutive calendar day beyond the number of days allowed by the Contract, which sum is agreed upon as reasonable and proper measure of damages that the Owner will sustain per diem by failure of Contractor to complete Work within time as stipulated; it is being recognized by Owner and Contractor that the injury to Owner that could result from a failure of the Contractor to complete on schedule, is uncertain and cannot be computed exactly. In no way shall costs of Liquidated Damages to be construed as a penalty to the Contractor. (See Bid Documents)

#### 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 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

« »  
§ 4.3 Unit prices, if any:

*(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)*

Item	Units and Limitations	Price Per Unit (\$0.00)
<input type="text"/>	<input type="text"/>	<input type="text"/>

§ 4.4 Allowances included in the Contract Sum, if any:

*(Identify allowance and state exclusions, if any, from the allowance price.)*

Item	Price
<input type="text"/>	<input type="text"/>

#### ARTICLE 5 PAYMENTS

##### § 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the County Engineer or his designee by the Contractor and Certificates for Payment issued by the County Engineer or his designee, 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 The Contractor shall submit a Preliminary Payment Request (Pencil Requisition) to the County Engineer or his designee on the twenty-fifth (25<sup>th</sup>) day of any given calendar month for Work performed during that month,

Upon receipt of the Pencil Requisition from the Contractor, the County Engineer or his designee shall review the Pencil Requisition and approve or disapprove of it in whole or in part as set forth hereafter. Within (4) calendar days of receipt of the Pencil Requisition from the Contractor, the County Engineer or his designee shall return the Pencil Requisition to the Contractor, with those charges that are approved or disapproved, if any, by the County Engineer or his designee, for the Contractor's incorporation into an Application for Payment. Within two (2) calendar days of return of the Pencil Requisition from the County Engineer or his designee, the Contractor shall submit a formal application for Payment to the County Engineer or his designee for review and approval by the County Engineer or his designee incorporating any revisions made by the County Engineer or his designee in the Pencil Requisition submission. Within five (5) calendar days of receipt of Contractor's Application for Payment, the County Engineer or his designee shall take any one of the following actions:

- 1) Certify the entire Application for Payment;
- 2) Certify partial payment and provide the Contractor with reasons for withholding the remaining portion of the payment; or
- 3) Withhold certification of the entire Application for Payment and provide the Contractor with reasons for withholding the entire payment,

Once the Application for Payment is certified either in whole or in part, the County Engineer or his designee shall transmit the Certified Payment Application within three (3) calendar days to the Owner for its review and payment. The Owner shall make payment to the Contractor for the Certified Payment Amount by no later than the time period set forth in the New Jersey Prompt Payment Act following receipt of the Certificate for Payment from the County Engineer or his designee. The Owner shall not be obligated to pay any Application for Payment until the Application for Payment is certified by the County Engineer or his designee. Approval of any Application for Payment may be withheld should the Contractor fail to submit Manning Reports in a timely manner.

Pursuant to N.J.S.A. 2A:30A-1 et seq. (the "Prompt Payment Act"), a public or governmental entity that requires the entity's governing body to vote on authorizations for each periodic payment, final payment, or retainage monies, such as the Owner, is excepted from the timing requirements of the Act. Accordingly, the Owner shall not approve the Contractor's Application for Payment until it is certified by the County Engineer or his designee in accordance herewith and shall not approve the Contractor's Certified Payment Application until the next scheduled public meeting of the Owner following the Owner's receipt of the Certified Payment Application from the County Engineer or his designee. The Owner shall not make payment to the Contractor for the Certified Payment Amount until the Owner's subsequent payment cycle following its approval of the Payment Application.

Pursuant to this same Act, if a payment due pursuant to the provisions herein is not made in a timely manner, the Owner shall be liable for the amount of money owed under the contract, plus interest at a rate equal to the prime rate plus one percent (1%), notwithstanding anything to the contrary in the Contract Documents. Interest on amounts due pursuant to the Act shall be paid to the prime contractor for the period beginning on the day after the required payment date and ending on the day on which the check for payment is received by the Contractor.

Pursuant to this same Act, disputes regarding whether a party has failed to make payments required by the Act may be submitted to a process of alternative dispute resolution, notwithstanding anything to the contrary in the contract documents, where the parties agree to same. Alternative dispute resolution permitted by the Act shall not apply to disputes concerning any other matters that may arise under or from this Contract. Any civil action brought to collect payments shall be conducted in Union County, State of New Jersey, and the prevailing party shall be awarded reasonable costs and attorneys' fees.

§5.1.4 The County Engineer or his designee may decide not to certify payment and may withhold a Certificate for Payment, in whole or in part, to the extent reasonably necessary to protect the Owner if, in the County Engineer or his designee's opinion, the representations as described in Section 5.1.5 below cannot be made to the Owner. If the County Engineer or his designee withholds a Certificate for Payment, the County Engineer or his designee will notify the Contractor and Owner as provided in Section 5.1.3 above. If the Contractor and County Engineer or his designee cannot agree on a revised amount, the County Engineer or his designee will issue a Certificate for Payment for the amount for which the County Engineer or his designee is able to make such representations to the Owner as set forth in Section 5.1.3 above. The County Engineer or his designee may also decide to withhold certifying

payment in whole or in part, or, because of subsequently discovered evidence or subsequent observations, to such extent as may be necessary in the County Engineer or his designee's opinion to protect the Owner from loss because of:

- .1 Defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims;
- .3 failure of the Contractor to make payments properly to Subcontractors or 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 another 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;
- .7 failure to carry out the Work in accordance with the Contract Documents;
- .8 avoidable delay in the progress of the Work;
- .9 deliberate delay in the submission for approval of names of Subcontractors, materialmen, sources of supply, shop drawings, and samples;
- .10 failure to maintain the Project Site in a safe and satisfactory condition in accordance with good construction practices as determined by the County Engineer or his designee; or
- .11 failure to submit updates as required by the General Conditions.

When the foregoing reasons for withholding certification are resolved, certification will be made for amounts previously withheld in the manner set forth in Section 5.1.3 above.

§5.1.5 The issuance of a separate Certificate for Payment will constitute representations made separately by the County Engineer or his designee to the Owner, based on its individual observations at the site and the data comprising the Application for Payment submitted by the Contractor, that the Work has progressed to the point indicated and that, to the best of the County Engineer or his designee's knowledge, information and belief, quality of the Work is in accordance with the Contract Documents.

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 minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the County Engineer or his designee. The

issuance of a separate Certificate of Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a separate Certificate for Payment will not be a representation that the County Engineer or his designees has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures; (3) reviewed copies of requisitions received from Subcontractor's and materials 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.

§5.1.6 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 County Engineer or his designee may require. This schedule, unless objected to by the County Engineer or his designee, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§5.1.7 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.

§ 5.1.8 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of  percent (  %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™-2007, General Conditions of the Contract for Construction;
- .2 Add 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), less retainage of  percent (  %);
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the County Engineer or his designee has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201-2007.

§5.1.9 The progress payment amount determined in accordance with Section 5.1.8 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the County Engineer or his designee shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201-2007.

§5.1.10 Retainage shall be determined as follows: Pursuant to N.J.S.A. 40A:11-6.1, the Owner will withhold two percent (2%) of the amount due on each partial payment when the outstanding balance of the Contract exceeds One Hundred Thousand Dollars (\$100,000.00).

§5.1.11 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 Section 12.2.2 of AIA Document A201-2007, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the County Engineer or his designee.

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

« »

**ARTICLE 6 DISPUTE RESOLUTION**

**§ 6.1 INITIAL DECISION MAKER**

The County Engineer or his designee will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201-2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as 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 County Engineer or his designee.)*

« »  
« »  
« »  
« »

## § 6.2 BINDING DISPUTE RESOLUTION

Except as provided in Section 5.1.3 of the Standard Form of Agreement between the Owner and Contractor, all claims, disputes or other matters in question between the parties to this Contract, arising out of or relating to the Project or to the Contract, or the alleged breach hereof, shall be subject one to mediation, and if not resolved, then same shall be decided in a Court of competent jurisdiction venued in Union County, New Jersey. No party may be compelled to submit any dispute concerning the Project to arbitration. In the event any claim arising from the Project is beyond the jurisdiction of the court, the Contract consents to joinder as a party to such action or alternative dispute proceeding.

## 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 A201-2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201-2007.

## ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201-2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall in no instance bear interest, except as required by law in accordance with Section 5.1.3 hereof.

§ 8.3 The Contractor shall ensure that the Project Site is maintained in a clean and safe condition at all times, based upon Owner's sole discretion. If the Contractor fails to keep the Project Site in a clean and safe condition, said failure shall result in the following:

- .1 all claims resulting from the Contractor's failure shall be the Contractor's responsibility;
- .2 said failure shall constitute an act of default and a substantial breach of the Contract giving the Owner remedies under the contract Documents; and
- .3 the Owner shall have the right to withhold any payments until the Contractor cures its failure.

Failure to do so shall authorize the Owner to withhold any Applications for payment until such time as the Contractor has rectified same. Further, if the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

§ 8.4 Indemnification – See Indemnification Requirements in Bid Documents.

§ 8.5 The within contract shall be governed by and interpreted pursuant to the law of the State of New Jersey.

§ 8.6 The Contractor shall comply with the anti-discrimination provisions of N.J.S.A. 10:2-1 et seq., the New Jersey Law Against Discrimination, N.J.S.A. 10:5-1 et seq., N.J.A.C. 17:27-1.1 et seq. and shall guarantee to afford equal opportunity in performance of the Work in accordance with an affirmative action program approved by the State Treasurer. (See Page G-21).

§ 8.7 The Contractor shall submit proof of Business Registration for itself and its subcontractors to the Owner and shall provide written notice to its subcontractors and suppliers of the responsibility to submit proof of business registration to the contractor. The requirement of proof of Business Registration extends down through all levels (tiers) of the Project.

The Contractor agrees to comply with the rules and regulations promulgated pursuant to the Contractor Use Tax Collection Legislation.

For the term of the contract, the Contractor, any subcontractor, and each of their affiliates [N.J.S.A. 52:32-44(g)93], shall collect and remit to the New Jersey Director of the Division of Taxation in the Department of Treasury, the use tax due pursuant to the "Sales and Use Tax Act," P.L. 1966, c. 30 (C.54:32B-1 et seq.) on all of their sales of tangible personal property delivered into the State of New Jersey, regardless of whether the tangible personal property is intended for a contract with a contracting agency. 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.

§8.8 This Standard Form of Agreement and the General Conditions set forth in the Bid Documents shall control in the case of conflict between these documents and the Project Specifications, the Project Manual, and any other exhibits incorporated by reference in this Contract.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below, and incorporated herein as if set forth in their entirety.

§ 9.1.1 The Agreement is this executed AIA Document A101-2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201-2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:  
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

« See Specifications as referenced by Exhibit B.

Section	Title	Date	Pages

§ 9.1.5 The Drawings:  
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

« See List of Drawings, annexed hereto as Exhibit C.

Number	Title	Date

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

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

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 AIA Document E201™-2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

■

.2 Other documents, if any, listed below:

■

**ARTICLE 10 INSURANCE AND BONDS**

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201-2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201-2007.)

Type of insurance or bond

Limit of liability or bond amount (\$0.00)

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

OWNER (Signature)

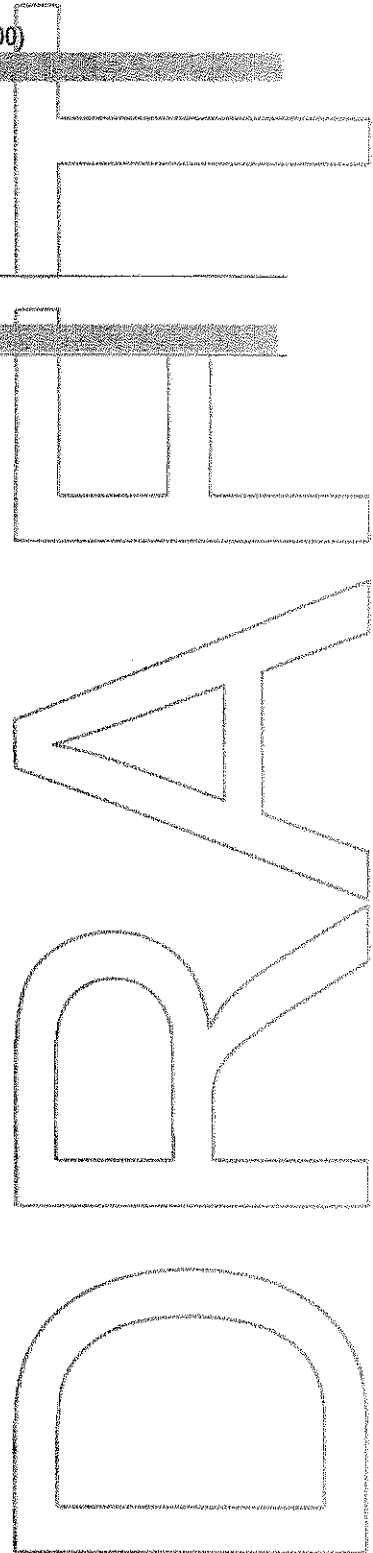
<><><>

(Printed name and title)

CONTRACTOR (Signature)

<><><>

(Printed name and title)





# DRAFT AIA Document A201™ - 2007

## General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

«County of Union»

« »

THE OWNER:

(Name, legal status and address)

« »

« »

THE ENGINEER, OR HIS DESIGNEE :

(Name, legal status and address)

« »

« »

### TABLE OF ARTICLES

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#### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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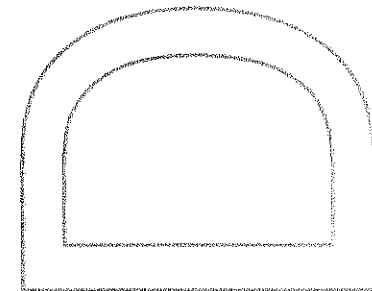
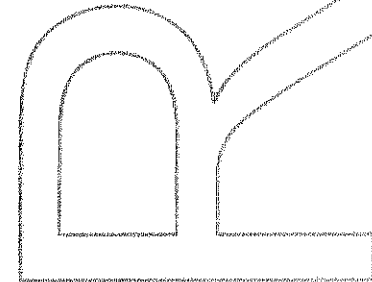
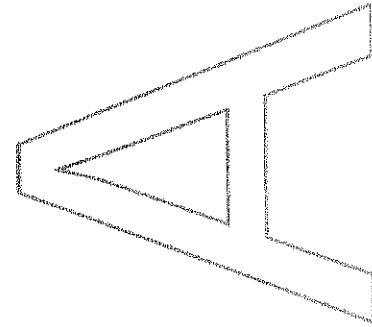
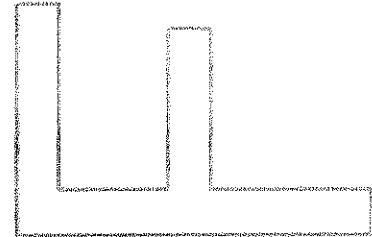
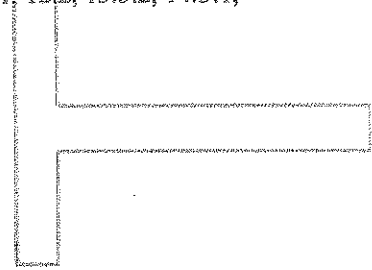
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**ARTICLE 1 GENERAL PROVISIONS**

**§ 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 or Engineer. 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 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 Engineer, or his designee or the Engineer, or his designee's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Engineer, or his designee or the Engineer, or his designee's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Engineer, or his designee's shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Engineer, or his designee'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 Engineer, or his designee and the Engineer, or his designee'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 and certify termination of the Agreement under Section 14.2.2.

**§ 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.

§ 1.2.2 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 Engineer, or his designee s.

### § 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 Engineer, or his designee and the Engineer, or his designee 's consultants shall be deemed the authors and Owners of their respective Instruments of Service, including the Drawings and Specifications. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this Project is not to be construed as publication in derogation of the Engineer, or his designee or Engineer, or his designee 's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Engineer, or his designee and the Engineer, or his designee 's consultants.

### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

## 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 elsewhere in the Contract Documents, the Engineer, or his designee does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

### § 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 The Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only in the event that: (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 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.

§ 2.2.3 If readily available, the Owner shall furnish surveys describing physical characteristics and legal limitations 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. The Contractor shall be responsible for requesting and obtaining a utility mark-out.

§ 2.2.4 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.

§ 2.2.5 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.

### § 2.3 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 Article 12 or 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. Owner shall in no way be responsible for any delays or claims arising from delays for enforcement of this Section.

### § 2.4 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 seven-day period after receipt of written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Engineer, or his designee's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

## 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 and shall maintain as current any approvals or certifications that may be required to perform the Work. 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 obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Engineer, or his designee in the Engineer, or his designee'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 2.2.3, 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 Engineer, or his designee any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Engineer, or his designee 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 Engineer, or his designee any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Engineer, or his designee may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Engineer, or his designee 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 make 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 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 Engineer, or his designee 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Engineer, or his designee and shall not proceed with that portion of the Work without further written instructions from the Engineer, or his designee. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 authorized by the Engineer, or his designee in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after

evaluation by the Engineer, or his designee 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

The Contractor warrants to the Owner and Engineer, or his designee 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 Engineer, or his designee, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Such warranty shall continue for a period of one (1) year from the date of Substantial Completion of the Work. Under this warranty, the Contractor shall remedy at his expense any such failure for the Work to be conforming to the requirement of the Contract, or any other defect appearing in the Work. In addition, the Contractor shall remedy at his own expense, any damage to Owner's owned, controlled, real or personal property, when that damage is the result of the Contractor's failure to provide conforming Work as it relates to the Contract Documents or any other defect of equipment, material, workmanship or design. The Contractor shall also restore any Work damaged in fulfilling its obligations under the terms of this provision. The Contractor's warranty with respect to the Work repaired or replaced hereunder will run for a period of one (1) year from the date of repair or replacement.

### § 3.6 TAXES

The Contractor shall pay 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 Engineer, or his designee before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Engineer, or his designee will promptly investigate such conditions and, if the Engineer, or his designee 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 an equitable adjustment in the Contract Sum or Contract Time, or both. If the Engineer, or his designee 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 Engineer, or his designee shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Engineer, or his designee's determination or recommendation, that party may proceed 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 Engineer, or his designee. 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.

§ 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. The unused balance of any allowance shall be deducted from the Contract Sum upon completion and acceptance of the Work by Change Order.

§ 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 furnish in writing to the Owner through the Engineer, or his designee the name and qualifications of a proposed superintendent. The Engineer, or his designee may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Engineer, or his designee has reasonable objection to the proposed superintendent or (2) that the Engineer, or his designee requires additional time to review. Failure of the Engineer, or his designee to reply 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 Engineer, or his designee 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 SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Engineer, or his designee's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Engineer, or his designee's approval. The Engineer, or his designee's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Engineer, or his designee reasonable time to review submittals. If the Contractor fails to submit a 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 Engineer, or his designee .

§3.10.4 Should the Contractor responsible for the scheduling requirements of Article 3 herein fail to comply with said scheduling requirements, said failure shall result in the following:

- 1 all claims resulting from the Contractor's failure to prepare or submit a schedule shall be the Contractor's responsibility;
- 2 shall constitute an act of default and a substantial breach of the Contract giving the Owner remedies under the Contract Documents; and
- 3 the Owner shall have the right to withhold any payments until the Contractor complies with the scheduling requirements of Article 3 herein.

§3.10.5 In the event of a Five Prime Contract, the General Contractor shall be responsible for the preparation and submittal of the schedule.

### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Engineer, or his designee and shall be delivered to the Engineer, or his designee 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 the way by which 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 Engineer, or his designee is subject to the limitations of Section 4.2.7. Informational submittals upon which the Engineer, or his designee 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 Engineer, or his designee without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Engineer, or his designee Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Engineer, or his designee 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 Engineer, or his designee 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 Engineer, or his designee .

§ 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 requirements of the Contract Documents by the Engineer or his designee 's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Engineer, or his designee in writing of such deviation at the time of submittal and (1) the Engineer, or his designee 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 Engineer, or his designee '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 Engineer, or his designee on previous submittals. In the absence of such written notice, the Engineer, or his designee '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 Engineer, or his designee ure 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. 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 Engineer, or his designee will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly 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 Engineer or his designee . The Owner and the Engineer, or his designee shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Engineer, or his designee have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Engineer, or his designee will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

### § 3.13 USE OF SITE

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Owner before using any portion of the Site.

§ 3.13.3 The Contractor shall store its apparatuses, materials, supplies, and equipment in such orderly fashion at the Site of the Work, if permitted, as will not unduly interfere with the progress of the Work or ongoing operations. The Contractor shall provide protective fencing around the designated storage areas.

§ 3.13.4 The Contractor shall see that stockpiles of materials and storage of equipment are kept to a minimum and neatly stored where directed by the Owner and the Engineer, or his designee .

§ 3.13.5 If the Work is to be executed in areas occupied by the Owner, the Contractor shall inform the Owner in advance of the areas scheduled to be worked on, so that the Owner's personnel may make proper preparations to protect equipment and records.

§3.13.6 The Contractor understands that some or all the Work of the Contract may be performed while the facilities are occupied by personnel, and accordingly shall make all reasonable and necessary provisions to ensure that the contract Work will be of minimal disruption to the environment.

§3.13.7 Materials and equipment that are to be used only directly in the Work, shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project Site. Protection of construction materials and equipment stored at the Project Site from weather, theft, damage and all other adversity is solely the Contractor's responsibility. The Contractor shall bear the responsibility to replace all such materials that may be lost, damaged, or stolen at its expense, whether such materials or equipment have been entirely or partially paid for by the Owner.

§3.13.8 The Contractor and any entity for whom the Contractor is responsibility, shall not erect any sign on the Project Site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

§3.13.9 Contractor shall ensure that the Work is performed at all times in a manner that affords reasonable access, both vehicular and pedestrian, to the Site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the Site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

§3.13.10 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project Site, including, without limitation, the lavatories, toilets, entrances, and parking areas, other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project Site and the Building, as amended from time to time. The Contractor shall immediately notify the Owner in writing, if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable. This notification shall set forth the problems of such compliance and shall suggest alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project Site and the Building.

### § 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 and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents. Any costs incurred by the Onwer for defective cutting or patching shall be borne by the Contractor responsible therefore.

§ 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 such construction by the Owner or a separate Contractor except with written consent of the Owner and of such separate Contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate Contractor the Contractor's 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 or 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 Owner shall be entitled to reimbursement from the Contractor, or shall be entitled to reduce the Contract Amount in an amount equal to the Owner's cost to clean up.

§3.15.3 The Contractor shall, on a daily basis, clean debris resulting from its Work, and protect construction in progress and maintain adjoining materials in place during handling and installation, and provide protective covering where required to assure protection from damage or deterioration until Substantial Completion.

§3.15.4 The Contractor shall clean and provide maintenance on completed construction, after installation, as frequently as necessary through the remainder of the construction period.

§3.15.5 The Contractor shall supervise its 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. The term "clean" shall include the removal of debris from the work area to dumpsters furnished by the Prime General Work Contractor or the Contractor for Single Overall Contract Work, whichever contracting method shall apply.

### § 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Engineer, or his designee 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 Engineer, or his designee harmless from loss on account thereof, but shall not be responsible for such 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 Engineer, or his designee. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Engineer, or his designee.

### § 3.18 INDEMNIFICATION

§ 3.18.1 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 Owner's consultants, agents, representatives, and employees from and against any and all claims, damages, losses, costs, and expenses, including, but not limited to attorney's 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 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 Owner and the Owner'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 claims, damage, loss, cost, or expense is attributable to bodily injury, sickness, disease or death, or to injury to destruction of tangible property (other than work itself) caused or alleged to be caused by the negligent acts, negligent omissions, and/or fault of the Owner or the Owner'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."

§ 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 ENGINEER, OR HIS DESIGNEE OR ENGINEER

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an Engineer, or his designee lawfully licensed to practice Engineer, or his designee in the jurisdiction where the Project is located. That person or entity is identified as the Engineer, or his designee in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Engineer, or his designee as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Engineer, or his designee. Consent shall not be unreasonably withheld.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Engineer, or his designee will provide administration of the Contract as set forth in its respective Agreements with the Owner and as described in the Contract Documents.

§ 4.2.2 The Engineer, or his designee 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.

§ 4.2.3 On the basis of the site visits, the Engineer, or his designee will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Engineer, or his designee about matters arising out of or relating to the Contract. Communications by and with the Engineer, or his designee's consultants shall be through the Engineer, or his designee. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Engineer, or his designee's evaluations of the Contractor's Applications for Payment, the Engineer, or his designee will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Engineer, or his designee has authority to reject Work that does not conform to the Contract Documents. Whenever the Engineer, or his designee considers it necessary or advisable, the Engineer, or his designee will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Engineer, or his designee 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 Engineer, or his designee to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Engineer, or his designee 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 Engineer, or his designee's action will be taken in accordance with the submittal schedule approved by the Engineer, or his designee or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Engineer, or his designee'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 Engineer, or his designee'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 Engineer, or his designee's review shall not constitute

approval of safety precautions or, unless otherwise specifically stated by the Engineer, or his designee, of any construction means, methods, techniques, sequences or procedures. The Engineer, or his designee's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Engineer, or his designee will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7. The Engineer, or his designee will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Engineer, or his designee 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 Engineer, or his designee agree, the Engineer, or his designee will provide one or more project representatives to assist in carrying out the Engineer, or his designee's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in the Owner's Agreement with the Engineer, or his designee.

§ 4.2.11 The Engineer, or his designee will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Engineer, or his designee'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 Engineer, or his designee 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 Engineer, or his designee will endeavor to secure faithful performance by both Owner and Contractor and will not show partiality.

§ 4.2.13 The Engineer, or his designee will review and respond to requests for information about the Contract Documents. The Engineer, or his designee's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Engineer, or his designee 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 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 Identification of Subcontractors required by N.J.S.A. 40A:11-16 shall be provided with the bid submission in accordance with the requirements of that statute. Names of persons or entities for any Subcontractor not covered by N.J.S.A. 18A-18 shall be furnished within thirty (30) thirty days of notification of Award of Contract. The Engineer, or his designee will notify the Contractor in writing if the Owner or Engineer, or his designee, after due investigation, has reasonable objection to any such proposed person or entity. The list of proposed Subcontractors shall include a description of the materials and equipment each proposes to furnish and install in the Work. The description shall be insufficient detail to allow the Engineer, or his designee to determine general conformance to Contract requirements. Approval of the submittals as required under this Article shall not relieve the Contractor from conformance to Contract requirements.

§5.2.2 Subcontractors shall comply with the statutory requirements of N.J.S.A. 34:11-56.25 and N.J.S.A. 34:11-56.48. Any subcontractors who fail to comply with those statutory provisions shall be rejected.

§5.2.3 Written confirmation of award of each major subcontract shall be submitted to the Owner by the Contractor, in form subject to his approval, within seven (7) days after receipt of Owner's approval of proposed Subcontractor list as provided under this Article. Every subcontract shall be in writing, shall be submitted to Owner for review and approval prior to execution, and shall specifically provide that the Owner is an intended third (3<sup>rd</sup>) party beneficiary of such subcontract.

§ 5.2.4 The Contractor shall not contract with a proposed person or entity to whom the Owner or Engineer, or his designee has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.5 If the Owner or Engineer, or his designee has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Engineer, or his designee 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.

§ 5.2.6 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Engineer, or his designee makes reasonable objection to such substitution.

### § 5.3 SUBCONTRACTUAL RELATIONS

§5.3.1 By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these Documents, assumes toward the Owner and Engineer, or his designee. Each subcontract agreement shall preserve and protect the rights of the Owner and Engineer, or his designee under the Contract Documents and at law. No Subcontract shall diminish in any way any rights or benefits conferred upon the Owner by these Contract Documents. The Contractor shall make all Contract Documents available to the Subcontractors.

§5.3.2 Where the Contractor sublets portions of the Work, the entire responsibility for the subdividing of Work rests with the Contractor. The Owner and the Engineer, or his designee are not responsible for the manner of the subdivision of the Work, nor will they enter into or settle disagreements or disputes between Contractor and Subcontractors. The Contractor is, and will be held, responsible for the proper execution of the Work of all 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 in writing.

§ 5.4.2 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity.

## 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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site.



§ 6.1.2 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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.

## § 6.2 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 report to the Engineer, or his designee apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report 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, except as to defects not then reasonably discoverable.

§ 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.4.1 Should the Contractor cause damage to the Work or property of any separate Contractor on the Project, the Contractor shall promptly settle with such other Contractor by agreement, or otherwise resolve the dispute. If such separate Contractor institutes any legal proceeding against the Owner on account of any damage alleged to have been so sustained, the Contractor shall, indemnify, defend, or bear the cost of defense as the Owner shall in its own discretion determine, and hold the Owner's harmless. Said Indemnification shall be governed by Section 13, Page G7 of the Instructions to Bidders.

§ 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 Engineer, or his designee will allocate the cost among those responsible, which amounts the Owner shall be entitled to reduce the Contract Amounts of the various contracts of 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. Change Orders and Construction Change Directives shall be subject to and processed in accordance with N.J.A.C. 6A:23-7 and N.J.A.C. 6A:26-4.9, where applicable.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Engineer, or his designee; a Construction Change Directive requires a written agreement by the Owner and Engineer, or his designee and may or may not be agreed to by the Contractor; an order for a minor change in the Work which does not extend the Contract Time, increase the Contract Sum or change the Project Scope may be issued by the Engineer, or his designee alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 In order to facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

## § 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Engineer, or his designee and signed by the Owner, Contractor and Engineer, or his designee 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.

A Change Order shall not require consent of the Owner if the Owner has provided an allowance for such a change.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum shall be those listed in Section 7.3.3.

§ 7.2.3 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change, and any and all adjustments to the Contract Sum and the construction schedule. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Applications for Payment as if such Work were originally part of the Contract Documents.

## § 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Engineer, or his designee and signed by the Owner and Engineer, or his designee, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. A Construction Change Directive shall not require the Agreement of the Engineer, or his designee if the Owner specifically waives their consent in writing. 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 7.3.6.

§ 7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Engineer, or his designee 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. The Contractor's failure to comply with a Construction Change Directive shall constitute an incident of default and cause for termination by the Owner.

§ 7.3.5 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.



§ 7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Engineer, or his designee shall determine the method and 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 Engineer, or his designee may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.6 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .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; and
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

§ 7.3.7 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 Engineer, or his designee. 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.

§ 7.3.8 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 Engineer, or his designee will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Engineer, or his designee determines, in the Engineer, or his designee's professional judgment, to be reasonably justified. The Engineer, or his designee'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.

§ 7.3.9 When the Owner and Contractor agree with a determination made by the Engineer, or his designee 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 Engineer, or his designee will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.10 In subparagraphs 7.3.3 and 7.3.6, the allowance for overhead and profit combined shall be based upon the following schedule:

- .1 For the Contractor, for work performed by his own forces, 10% of cost.
- .2 For each Subcontractor, for the work performed by his own forces, 10% of cost.
- .3 For the Contractor, for work performed by a subcontractor, 5% of cost.

§ 7.3.11 Lump sum quotations for changes in the Work will not be accepted. Proposals shall be completely itemized and broken down. They shall be accompanied by such supporting data as the Engineer, or his designee may require, such as copies of subcontractor's or vendor's quotations, quantity take-off sheets, or other similar information.

#### § 7.4 MINOR CHANGES IN THE WORK

The Engineer, or his designee has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Engineer, or his designee and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

#### 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 and services as required by the Contract

Documents, Substantial Completion of the Work shall be accomplished within the period of consecutive calendar days (or by the date), as stated in the Agreement, plus any authorized extension(s) of time as approved by written agreement. Final Completion of the Work shall be no later than thirty (30) consecutive calendar days from the date of Substantial Completion of the Work, unless otherwise set forth in Article 3.2 of the Owner/Contractor Agreement.

§ 8.1.2 Intentionally omitted

§ 8.1.3 Intentionally omitted.

§ 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. There will be no bonus or incentives paid, should the Work, or any portion thereof, be completed in advance of the specified activity milestone dates.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 Intentionally omitted

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Intentionally omitted

§ 8.3.4 No payment, compensation, or adjustment of any kind shall be made to the Contractor by the Owner for damages resulting from hindrances or delays caused by the delays of other contractors, or from foreseeable circumstances not attributable to the Owner's conduct. The Contractor agrees that it will make no claim against the Owner for payment, compensation, damages, mitigation of Liquidated Damages, or adjustment of any kind for such hindrances or delays, and will accept such extensions of time as may be granted by the Owner in the Owner's sole discretion in full satisfaction for any and all alleged claims against the Owner for any and all such hindrances or delays. For purposes of this Agreement, disputes arising between contractors before or during construction, adverse weather conditions, and delays on the part of local authorities issuing permits shall be considered foreseeable circumstances. Notwithstanding the foregoing, nothing herein shall limit the Contractor's remedies for Owner's negligence, bad faith, active interference, tortious conduct, or other reasons unanticipated by the parties that delay expenditures paid by the Owner to the Engineer, or his designee, other individual or entity, or to any inspector or inspectors necessarily employed by it on the Work, for any number of days in excess of the Contract Time, shall be deducted for the Contract Sum.

§ 8.3.5 The provisions of this Article shall not be so interpreted or construed as to preclude or prevent the Contractor from making and prosecuting any claim against any separate Contractor engaged or employed by the Owner for damages alleged to have been caused or occasioned by any such separate Contractor.

§ 8.3.6 To the extent permitted by law, the Owner may suspend the whole or any part of the Work, if it shall deem it for the best interest of the Owner to do so, without compensation to the Contractor for such suspension, other than extending the time for completion of the Work as much as it may have been delayed by such suspension. During such suspension, all materials delivered upon, but not placed in the Work shall be neatly piled by the Contractor so as not to obstruct public travel, or shall be removed from the line of Work at the direction of the Owner and, unless the

materials be moved by the Contractor upon such direction, the materials shall be removed by the Owner and expense thereof will be charged to the Contractor.

§8.4.1 Should the Contractor fail to complete fully, and in conformity with all provisions of the Contract within the Contract Time, the Contractor shall, and hereby agrees to, pay the Owner one thousand dollars (\$1,000.00) per day, for each consecutive calendar day beyond the number of days allowed by the Contract, which sum is agreed upon as reasonable and proper measure of damages that the Owner will sustain per diem by failure of Contractor to complete Work within time as stipulated; it being recognized by Owner and Contractor that the injury to Owner that could result from a failure of the Contractor to complete on schedule, is uncertain and cannot be computed exactly. In no way shall costs of Liquidated Damages be construed as a penalty to the Contractor.

§8.4.2 It is expressly understood and agreed by and between the Contractor and Owner that the Contract Time prescribed herein is a reasonable time for the completion of the Work.

## ARTICLE 9 PAYMENTS AND COMPLETION

### § 9.1 CONTRACT SUM

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.

### § 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Engineer, or his designee, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Engineer, or his designee may require. This schedule, unless objected to by the Engineer, or his designee, shall be used as a basis for reviewing the Contractor's Applications for Payment.

### § 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 See Article 5 of Standard Form of Agreement between Owner/Contractor.

§ 9.3.1.1 Applications for Payment may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

§ 9.3.1.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.

§ 9.3.1.3 All applications for payment shall be accompanied by the Application and Certificate of Payment, AIA Document G702, and the Continuation Sheet, AIA Document G703, fully completed as required or such other application for Payment as the Owner's representative shall use.

§9.3.1.4 In cases where the work is awarded on a Single Overall Contract basis, payments shall be made in accordance with applicable State of New Jersey statutes.

§ 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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§9.3.3.1 All municipal mechanic's liens filed by a lien claimant shall be governed by N.J.S.A. 2A:44-125 et seq. In the event a municipal mechanic's lien is filed, the Owner reserves the right to withhold the full amount of the lien. The Owner may release the funds to the party against whose account the lien is claimed, only after that party files with the Owner's financial officer, a bond in an amount double of all sums claimed ("Double Bond") under the lien, and such bond's form has been approved by the Owner's chief law officer and financial officer, per N.J.S.A. 2A:44-130 or if an acceptable release of liens is filed by the lien claimant.

#### § 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 See Article 5 of Standard Form of Agreement between Owner and Contractor.

§ 9.4.2 See Article 5 of Standard Form of Agreement between Owner and Contractor

§9.4.3 See Article 5 of Standard Form of Agreement between Owner and Contractor.

#### § 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 See Article 5 of Standard Form of Agreement between Owner and Contractor

§ 9.5.2 See Article 5 if Standard Form of Agreement between Owner and Contractor.

#### § 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Engineer, or his designee 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 Engineer, or his designee

§ 9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, 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 and shall certify same to Owner. 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 Engineer, or his designee 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 Owner and Engineer, or his designee on account of portions of the Work done by such Subcontractor.

§ 9.6.4 Neither the Owner nor Engineer, or his designee shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 9.6.5 Payment to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

#### § 9.7 FAILURE OF PAYMENT

If the Engineer, or his designee 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 Engineer, or his designee or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Engineer, or his designee, 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 shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

#### §9.7 REIMBURSEMENT TO OWNER

§9.7.1 If the Owner is entitled to any reimbursement or payment from the Contractor under, or pursuant to, the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any

payment then, or thereafter, due the Contractor from the Owner; or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

### § 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; provided, however, that a condition precedent to Substantial Completion shall be the Owner's receipt of all certificates of occupancy (permanent or temporary) and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the occupancy of the Project. The Owner may withhold a certification of Substantial Completion if temporary installations or temporary construction exists in areas requesting certification, or if certificates of occupancy are temporary or conditional.

§ 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 Engineer, or his designee shall prepare a comprehensive list of items to be completed or corrected ("Punch List"). The Contractor shall proceed immediately and correct items on the list. 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. Upon receipt of the list, the Engineer, or his designee, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Engineer, or his designee's inspection discloses any item, whether or not included on the list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Engineer, or his designee. The Contractor shall then submit a request for another inspection by the Engineer, or his designee to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Engineer, or his designee will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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. The Certificate of Substantial Completion shall be submitted to the Contractor for its written acceptance and to the Owner for its approval and acceptance as required by Section 9.8.1. No Certificate of Substantial Completion shall be deemed effective unless executed by both Owner and Contractor.

### § 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, who shall obtain all necessary modifications to its insurance coverage to permit such occupancy or use. In addition, Contractor shall obtain consent of those public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete pursuant to the terms of that Agreement. When the Contractor considers a portion substantially complete, the Engineer, or his designee shall prepare a Punch List as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Engineer, or his designee 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.

§ 9.9.4 The occupancy of any portion of the Work shall not constitute acceptance of any Work, except as hereinafter stated, nor does it waive the Owner's right to Liquidated Damages. Final Acceptance of the Work shall be for the whole Work only and not part.

§ 9.9.5 Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims on behalf of the Owner or Contractor against each other.

**§ 9.10 FINAL COMPLETION AND FINAL PAYMENT**

**§ 9.10.1** Upon completion of the Work, the Contractor shall forward to the Engineer, or his designee a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Engineer, or his designee a final Contractor's Application for Payment. The Engineer, or his designee will promptly make such inspection. When the Engineer, or his designee finds the Work acceptable under the Contract Documents and the Contract fully performed, the Engineer, or his designee will promptly issue a final Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with terms and conditions of 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 Engineer, or his designee'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 complies with all requirements set forth in Section 6 of the Standard Form of Agreement between Owner and Contractor and the Contractor submits to the Engineer, or his designee (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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

**§ 9.10.3** Intentionally omitted

**§ 9.10.4** Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee

**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. The Contractor shall submit the Contractor's safety program to the Engineer, or his designee for review and coordination with the safety programs of other Contractors.

**§ 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 or the Contractor's Subcontractors or Sub-subcontractors; 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.
- .4 Construction or operations by the Owner or other Contractors.

**§ 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 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 Owners and users of adjacent sites and utilities.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner or Engineer, or his designee 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 Engineer, or his designee.

§ 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Engineer, or his designee in writing.

§ 10.3.2 Upon receipt of the Contractor's written 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 Engineer, or his designee the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance.

#### § 10.3.3 Intentionally omitted

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 Intentionally omitted

§ 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 LIABILITY INSURANCE

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

1. Automobile Liability Insurance in any amount of not less than \$1,000,000.00 combined single limits for Bodily Injury and Property Damage Liability. A certificate of such current insurance will be provided to the County and will reflect the provision of at least thirty (30) days notice to the County before any major cancellation or major change may be made the policy.

2. Workers Compensation Insurance insuring the obligations of the Contractor and all Subcontractors under the New Jersey Workers Compensation and Occupational Disability Laws as respects to Work performed under the Contract. Insurance will be extended to include any obligations under the United States Longshoremen's and Harbor Workers Act or any maritime act, when applicable.

3. General Liability Insurance will be provided on a Comprehensive General Liability form with a combined single limit of \$3,000,000.00 per occurrence for Bodily Injury Liability and Property Damage Liability and will include the interest of the County with respect to Work emanating from the Contract with the County. The insurance will include the following:

- a) Personal Injury Liability
- b) Blanket Contractual Liability applies to assumption of liability under any written Contract
- c) Coverage for A, X, C, U exposures, relating to excavation, blasting underground damage
- d) Broad Form Property Damage Liability
- e) Products and/or Completed Operations Liability

A Certificate of Insurance will be filed with the County prior to commencement of any Work. This certificate will contain a provision that insurance afforded under the policies will not be canceled without at least (30) days prior written notice being given to the County.

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§ 11.1.2 The insurance required by Section 11.1.1 shall remain in effect for the duration of the project, i.e., from beginning of construction until final payment and closeout.

§ 11.1.3 All insurance required by Section 11.1.1 shall be issued by insurance companies authorized to do business in the State of New Jersey and rated as "A" or better as determined by A.M. Best Company.

§ 11.1.4 The Contractor waives all rights against the Owner for damages caused by fire or other perils to the extent covered by insurance provided under this Article. Any deductibles, co-insurance, or contribution to the loss will be borne solely by the Contractor.

§ 11.1.5 A certificate of insurance evidencing the coverages required by Section 11.1.1 shall be submitted to the Owner's attorney for approval and transmittal to the Owner and Engineer, or his designee prior to the commencement of the Work. The certificate must be submitted on the ACORD form Certificate of Insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least thirty (30) days written notice has been given to the Owner. If requested by the Owner, the Contractor shall provide complete copies of any policies of insurance required by this Contract to be obtained by the Contractor and Subcontractor(s). Information concerning any reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

§ 11.2 PROPERTY INSURANCE

§ 11.2.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost



basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurance interest in the property required by this Section 11.2 to be covered, whichever is earlier. This insurance shall include the interest of the Owner, Contractor, Subcontractor(s), and Sub-Contractor(s) in the Work.

§ 11.2.1.1 Property insurance shall be on an "all-risk" policy form and shall be against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Engineer, or his designee's services and expenses required as a result of such insured loss. Coverage for all other perils shall not be required unless otherwise provided in the Contract Documents.

§ 11.2.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractor(s) and Sub-subcontractor(s) in the Work. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.2.1.3 If the property insurance requires minimum deductibles, and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles over the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles.

§ 11.2.1.4 Unless otherwise provided in the Contract documents, this property insurance shall cover portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also portions of the Work in transit.

§ 11.2.1.5 A loss insured under Owner's property insurance 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 mortgage clause and of Section 11.3.10. The Contractor shall pay Subcontractor(s) their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractor(s) to make payments to their Sub-Contractor(s) in a similar manner.

#### § 11.2.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds. The Owner as fiduciary shall have the power to adjust and settle a loss with insurers.

#### § 11.2.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused.

§ 11.2.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

#### § 11.3 PERFORMANCE BOND, PAYMENT BOND AND MAINTENANCE BOND

§ 11.3.1 Contractor, at its sole expense, shall furnish bonds covering faithful performance of the contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract, including material and labor..

§ 11.3.2 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 made

§ 11.3.3 The Contractor shall file with the Owner, as a condition of final acceptance, a statement from the Surety of its Performance Bond and Payment Bond, that the Surety is satisfied that all claims for labor and material supplied under its contract have been satisfactorily settled.

§ 11.3.4 As a condition of Substantial Completion of the Work, the Contractor shall provide an acceptable Maintenance Bond in accordance with section 16, page G-9 of the Instructions to Bidders.

## ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

### § 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work uncovered is contrary to the Engineer, or his designee's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Engineer, or his designee, be uncovered for the Engineer, or his designee's examination and be replaced at the Contractor's expense without change in the Contract Time or Contract Sum.

§ 12.1.2 If a portion of the Work has been covered that the Engineer, or his designee has not specifically requested to examine prior to its being covered, the Engineer, or his designee may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate Contractor in which event the Owner shall be responsible for payment of such costs.

### § 12.2 CORRECTION OF WORK

The Contractor shall promptly correct Work rejected by the Engineer, or his designee or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 Engineer, or his designee's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 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 an 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 written 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. The Contractor shall give such notice promptly after discovery of the non-conforming work. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after the receipt of notice from the Owner or Engineer, or his designee, the Owner may correct it in accordance with Section 2.4. This obligation under Section 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract.

§ 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 Intentionally omitted.

§ 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 work, whether completed or partially completed, of the Owner or separate contractors 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, nor to any deficient Work discovered after the one-year period that could not have readily been discovered.

### § 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. However, there shall be no implied or expressed acceptance of Work not in compliance with applicable law. The amount of said reduction will be within the exclusive determination of the Owner as its representative.

## ARTICLE 13 MISCELLANEOUS PROVISIONS

### § 13.1 GOVERNING LAW

§ 13.1.1 The Contract shall be governed by the laws of the State of New Jersey.

§ 13.1.2 Nothing in the Contract Documents shall be construed to permit deviation from the governing law.

§ 13.1.3 In accordance with N.J.S.A. 40A:11-18, American manufactured products or materials shall be used in the Work, wherever possible.

### 13.1.4 RATE OF WAGES

Where the Project is not subject to a Project Labor Agreement, wage notes shall be paid pursuant to the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq, the Contractor and Subcontractor are required to do the following:

§ 13.1.4.1 Pay to all workmen engaged in the performance of services, directly upon a public work, the prevailing rate of wages, which shall be those in effect for the Project site(s) on the Contract Date and such rates shall remain in effect for (2) years, unless superseded by a subsequent determination.

§ 13.1.4.2 Before final payment, furnish Owner with an affidavit stating that all workmen have been paid the prevailing rate of wages specified in the contract.

§ 13.1.4.3 Keep an accurate record showing the name, craft, or trade and actual hourly rate of wages paid to each workman employed by it in connection with any public work. Records shall be preserved for two (2) years from date of payment.

§ 13.1.4.4 Post the prevailing wage rated 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, and at such place or places as are used by them to pay workmen their wages.

§ 13.1.4.5 Submit the Owner, certified payroll records for each payroll period within ten (10) days of the date of the payment of wages. A certified payroll record is defined as "a payroll record that is attested by the employer or the Owner of the company doing business as the employer, or a corporate officer of such company, or an authorized agent of the employer". A copy of the certified payroll form for submission of the payroll records may be obtained by contacting the Department of Labor, Division of Workplace Standards at 609.292.2259.

§ 13.1.4.6 In the event the Owner finds that any workers employed by the Contractor or Subcontractor, covered by the said contract, have been paid a rate of wages less than the prevailing wage required to be paid by such contract, the Owner may terminate the Contractor's or Subcontractor's right to proceed with the Work, or such part of the

Work as to where there has been a failure to pay required wages, and to prosecute the Work to completion or otherwise, the Contractor and its sureties shall be liable to the Owner for any excess costs occasioned thereby,

§ 13.1.4.7 a current wage rate determination is on file at the offices of the Owner for inspection and Contractor's use.

### § 13.1.5 SAFETY AND HEALTH REGULATIONS (OSHA)

§ 13.1.5.1 The Contractor shall comply with the laws, rules, regulations and codes dealing with occupational safety and health, including, but not limited to, the latest amendments of the following:

§ 13.1.5.2 Williams – Steiger Occupational Safety and Health Act of 1970, Public Law 91-595

§ 13.1.5.3 Part 1910 – Occupational Safety and Health Standards Chapter XVII of Title 29, Code of Federal Regulations.

§ 13.1.5.4 Part 126 – Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

§ 13.1.5.3 N.J.A.C. 8:59-5.1-5.109 requirements properly label any substances stored in containers) of the Worker and Community Right to Know Act, P.L. 1983, c.315.

### § 13.1.6 ENVIRONMENTAL REGULATIONS

§ 13.1.6.1 The Contractor shall comply with laws, rules, regulations, and codes dealing with the prevention of environmental pollution and the preservation of public natural resources, including but not limited to, the latest amendments of the following:

§ 13.1.6.2 Chapter 251, public Law of 1975 of the State of New Jersey, "soil Erosion and Sediment Control Act."

### § 13.1.7 AFFIRMATION ACTION EMPLOYMENT LAW

Contractor agrees to comply with the terms of the Mandatory Equal Employment Opportunity Language, a copy of which is annexed to the Contract Documents as Exhibit F and incorporated as if set forth herein.

§ 13.1.7.1 Contractor shall submit a copy of the 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 Owner

§ 13.1.7.2 Contractor shall complete and submit to the Owner an Initial Project Workforce Report, New Jersey Department of Treasury Form AA 201, upon notification of award and no later than the execution of this Agreement. Failure to submit this completed form may result in this Agreement being terminated.

### § 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, neither party to the Contract shall assign the Contract as a whole without written consent of the other, unless as may be provided for elsewhere in the Contract Documents. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

### § 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

### § 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

§ 13.4.2 No action or failure to act by the Owner, Engineer, or his designee 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 there under, except as may be specifically agreed in writing.

### § 13.5 TESTS AND INSPECTIONS

§ 13.5.1 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 Engineer, or his designee timely notice of when and where tests and inspections are to be made so that the Engineer, or his designee may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Engineer, or his designee, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Engineer, or his designee 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 Engineer, or his designee of when and where tests and inspections are to be made so that the Engineer, or his designee may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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 Engineer, or his designee's services and expenses shall be at the Contractor's expense.

§ 13.5.4 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 Engineer, or his designee.

§ 13.5.5 If the Engineer, or his designee is to observe tests, inspections or approvals required by the Contract Documents, the Engineer, or his designee will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

### § 13.6 INTEREST

Except as required by Section 5.1.3 of the Owner Contractor Agreement and notwithstanding anything to the contrary contained in the Contract Documents and related documents, the Owner will pay no interest whatsoever for any payments due.

### § 13.7 TIME LIMITS ON CLAIMS

Intentionally deleted.

## 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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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;

§ 14.1.2 Intentionally deleted

§ 14.1.3 If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon thirty (30) days' written notice to the Owner and Engineer, or his designee, terminate the Contract

§ 14.1.4 Intentionally deleted.

#### § 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor after Notice and an opportunity to cure.

- .1 refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 disregards laws, ordinances, rules or regulations, or orders of a public authority having jurisdiction;
- .4 fails to furnish the Owner with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all requirements of the Contract Documents;
- .5 fails after commencement of the Work, to proceed continuously with the construction and completion of the Work, for more than three (3) days, except as permitted by the Contract Documents;
- .6 disregards orders of the Owner or Engineer, or his designee;
- .7 fails to maintain the Site in a clean, safe and orderly manner;
- .8 fails to comply with a Construction Change Directive; or
- .9 otherwise is guilty of any breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written 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. And charge the costs incurred against the Contractor's Contract balance

§ 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. The Engineer, or his designee's certification issued pursuant to Section 14.2.2 shall be given a presumption of correctness.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Engineer, or his designee'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 Engineer, or his designee, 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 Intentionally deleted.

#### § 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 written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

## 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 adjustment or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. Any Contractor Claim seeking the payment of money shall not include consequential damages, which Contractor hereby waives, and shall be calculated in accordance with Section 7.3.6 and Section 7.3.10 hereof.

#### § 15.1.2 DECISION OF ENGINEER, OR HIS DESIGNEE

Owner and Contractor agree that the Engineer, or his designee shall be the initial arbiter of all Claims, including those alleging error or omission by the Engineer, or his designee. All claims, shall be referred, initially to the Engineer, or his designee for action as provided in Article 4 and shall be required as a condition precedent to litigation of a Claim between the Contractor and Owner to all such matters arising prior to the date final payment is due, regardless of: (1) whether such matters relate to execution and progress of the Work; or (2) the extent to which the work has been completed. The decision by the Engineer, or his designee in response to a Claim shall not be a condition precedent to litigation in the event: (1) the position of the Engineer, or his designee is vacant; (2) the Engineer, or his designee has not received evidence or has failed to render a decision within agreed time limits; (3) the Engineer, or his designee has failed to take action required under Article 4 within thirty (30) days after the Claim is made; (4) forty-five (45) days have passed after the Claim has been referred to the Engineer, or his designee; or, (5) the claim relates to a mechanic's lien.

#### § 15.1.3 TIME LIMITS ON CLAIMS

Claims must be within twenty one (21) calendar days after the occurrence of the event giving rise to the Claim or within twenty-one (21) calendar days after the claimant first becomes aware of the condition giving rise to the Claim, whichever is later. There shall be no time limitation upon any Claims made by the Owner. Claims must be made by written notice to the Engineer, or his designee. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted pursuant to the requirements of this Paragraph. Notice shall be deemed effective upon the Engineer, or his designee's receipt of the Notice.

#### § 15.1.4 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments to the extent required by the Contract Documents.

#### § 15.1.5 CLAIMS FOR CONCEALED OR UNKNOWN CONDITIONS

If conditions are encountered at the Site which are: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents; or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for the Contract Documents, the Owner and Contractor mutually agree to give written notice to each other; including the Engineer, or his designee and any affected Contractor or subcontractor, upon the observation of the condition within twenty-four (24) hours of first observation of the condition. The Engineer, or his designee will investigate such conditions within seventy-two (72) hours and will diligently process and render a recommendation within twenty-one (21) days unless otherwise agreed in writing. If the Engineer, or his designee determines that the condition 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 Engineer, or his designee shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in

opposition to such determination must be made within seven (7) days after the Engineer, or his designee has given notice of the decision.

#### § 15.1.6 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum written notice as provided herein shall be given before proceeding to execute the Work. All documentation in support of the Contractor's request shall, likewise be provided at the time said written request is made. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3 or elsewhere in the Contract Documents.

#### § 15.2 CLAIMS FOR ADDITIONAL TIME

§ 15.2.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work, , all documentation in support of the Contractor's request shall, likewise be provided at the time said written request is made. In the case of a continuing delay, only one Claim is necessary.

§ 15.2.2 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. The term "abnormal" as used here shall be construed according to the following formula: average rainfall (or snow, low temperature, etc) for the past five (5) years for the month in question, plus ten percent (10%). Accordingly, weather is not deemed to be abnormal unless it is ten percent (10%) worse than the average for the month over the past five (5) years. Claims relating to weather must be submitted within seven (7) calendar days of the occurrence of any such delays.

§ 15.3 CLAIMS FOR INJURY OR DAMAGE TO PERSON OR PROPERTY. If either Party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party, including the Engineer, or his designee , within a reasonable time not exceeding twenty-one (21) days after first occurrence, unless another time period is required by law. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided for in Article 15.

§ 15.3.2 The Owner is not required to institute a claim under this section in order to terminate this Agreement.

#### § 15.4 RESOLUTION OF CLAIMS AND DISPUTES

The Engineer, or his designee will review Claims and take one or more of the following preliminary actions with ten (10) days of receipt of a Claim: (1) request additional supporting data from the claimant; (2) reject the Claim in who or in part, stating reasons for rejection ; (3) recommend approval of the Claim by other party; or (4) suggest a compromise.

§ 15.4.2 If a Claim has been resolved, the Engineer, or his designee will prepare or obtain appropriate documentation in consultation with Owner's counsel as circumstances dictate.

§ 15.4.3 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Engineer, or his designee , the Engineer, or his designee will notify the parties in writing that the Engineer, or his designee 's decision will be made within seven (7) days, which decision shall be final. Upon expiration of such time period, the Engineer, or his designee will render to the parties the Engineer, or his designee 's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both.

#### § 15.5. CLAIMS FORUM

Unless otherwise required by Section 5.1.3 of the Standard Form of Agreement between the Owner and Contractor, claims, disputes, or other matters in question between the parties to this Contract arising out of or relating to the Project or to this Contract, or the alleges breach thereof, shall be subject in the first instance to mediation and failing that, there in, a Court of competent jurisdiction venued in Union County, New Jersey. The Owner may not be compelled to submit any dispute concerning the Project to arbitration. By accepting award of the Contract and executing the Agreement, the Contractor consents to its joinder as a party in any litigation, mediation, arbitration or any other legal proceeding involving the Project and any references in the Contract documents.



§ 16.1 INTERPRETATIONS IN WRITING

§ 16.1.1 Neither the price bid for the work of any Contract, nor the Contract Sum, shall be based in any manner upon oral opinions, or real or alleged instructions of an oral nature, regardless if whether such opinions or instructions are expressed by the Owner, the Engineer, or his designee or its Consultants, the Contractor, or agents or representative of any of them and no such oral communication shall form the basis of a Claim.

§ 16.1.2 These provisions do not intend to deny, on an oral basis, normal discussion, recommendations, explanations, suggestions, approvals, rejections, and similar activity in pursuit of the work of the Project, such as at job conferences and otherwise at the Site. In such instances, the written minutes, correspondence, shop drawing records, written field orders, and other written data shall govern over personal claims regarding statements made contrary to the written data.

§ 17.1 JOB SITE MEETINGS

§ 17.1.1 Job site meetings, when called by the Engineer, or his designee, shall be held at a location and time convenient to the Owner's representatives, the Engineer, or his designee, and Contractor(s). Each Contractor shall attend such meeting, or be represented by a person in authority who is thoroughly familiar with the Project and who can speak and make decisions for the Contractor. In the instance of a Single Overall Contract, each of the major Subcontractors-Structural Steel, and ornamental iron work, plumbing, gas fitting and all kindered work and steam power plants, steam, and hot water heating and ventilating apparatus and Electrical-shall have a person in authority who is thoroughly familiar with the Project attend the meetings.

§ 18.1 MANDATORY LAW AGAINST DISCRIMINATION LANGUAGE  
PROCUREMENT, PROFESSIONAL AND SERVICE CONTRACTS  
(N.J.A.C. 13:6-1.3)

§ 18.1.1 The parties of this contract do hereby agree that the provision of N.J.S.A. 10:2-1 through N.J.S.A. 10:2-4 dealing with discrimination in employment on public contracts, and the rules and regulations promulgated pursuant thereto, are hereby made a part of this contract and are binding upon them.

§ 18.1.1 Pursuant to the provision of N.J.S.A. 10:2-1 through N.J.S.A. 10:2-4, during the performance of this contract, the Contractor agrees as follows:

§ 18.2.1.1 In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no Contractor, including without limitation, the Contractor, nor any person acting on behalf of such Contractor or subcontractor, shall by reason of race, creed, color national origin, ancestry, Marital status, gender identity or expression, affectional or sexual orientation, or sex, discriminate against any person who is qualified and available to perform the Work, to which the employment relates;

§ 18.2.1.2 No Contractor, including, without limitation, the Contractor, Subcontractor, nor any person acting on its behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this Contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such Contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation, or sex;

§ 18.2.1.3 There may be deducted from the amount payable to the Contractor by the Owner, under the Contract, a penalty of \$50.00 (fifty dollars) for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the Contract; and

§ 18.2.1.4 This contract may be canceled or terminated by the Owner, and all the money due or to become due hereunder may be forfeited, for any violation of this section of the Contract occurring after notice to the Contractor from the contracting public agency or any prior violation of this section of the Contract.

§ 19.1 CONTRACTOR AND SUBCONTRACTOR COLLECTION OF USE TAX TO LOCAL GOVERNMENTS

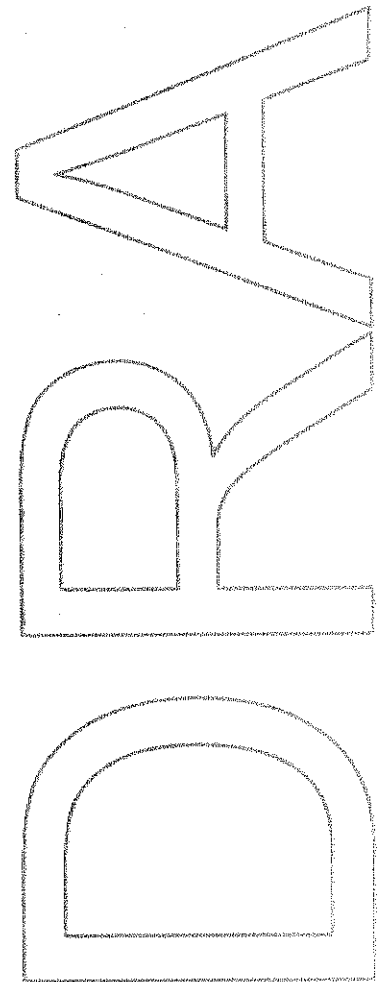
§ 19.1.1 The Contractor acknowledges and agrees that pursuant to P.L. 2004, c. 57, enacted by the State of New Jersey on June 29, 2004, contractors or contractors with subcontractors, or their affiliates, who enter into contracts

with New Jersey local government entities, including without limitation, boards of education, are, effective as of September 1, 2004, required to collect and remit to the New Jersey Director of Taxation in the Department of the Treasury the use tax pursuant to the "sales and Use Tax Act," P.L. 1966, c. 30 (C.54:32B-1 et. seq.) on all their sales of tangible personal property delivered into the State of New Jersey (hereinafter referred to as the "Contractor Use Tax Collection Legislation").

§ 19.2.1 The Contractor hereby covenants and agrees that the Contractor, any subcontractor and each of their affiliates, shall collect and remit to the New Jersey Director of the Division of Taxation in the Department of Treasury, the use tax due pursuant to the "Sales and Use Tax Act," P.L. 1966, c. 30 (C.54:32B-1 et. seq.) on all their sales of tangible personal property delivered into the State of New Jersey. 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.

§ 19.3.1 The parties intend that this Article 19 shall comply with the rules and regulations promulgated pursuant to the Contractor Use Tax Collection Legislation and shall be interpreted consistent therewith.

§ 19.4 Notwithstanding anything contained in the Agreement to the contrary, the Contractor hereby agrees to indemnify and hold the Owner harmless from and against any and all fines, taxes, penalties, interest, claims, losses. Costs, expenses, liabilities, or damages arising out of or in connection with the Contractor's failure to comply with the terms and condition of Sections 19.1 and 19.2 to the fullest extent permitted by law and public policy.





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](http://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 not 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									
	65%	70%	75%	80%	85%	90%	95%			
1000 Hours										
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, holiday 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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

- 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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**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**

	10/01/20
Deputy Foreman	W47.45 B33.73 T81.18
Foreman	W50.45 B33.73 T84.18
Journeyman	W44.45 B33.73 T78.18

**Craft: Bricklayer, Stone Mason**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	50%	55%	60%	65%	70%	75%	80%		
6 Months										
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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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**

	05/07/20
Foreman	W59.06 B34.29 T93.35
Journeyman	W51.36 B29.90 T81.26

**Craft: Carpenter                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	57% of	Appren	tice	Wage	for all	intervals	+ \$0.63			

**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**

	05/05/20
Foreman	W59.06 B34.20 T93.26
Journeyman	W51.36 B29.81 T81.17

**Craft: Carpenter - Resilient Flooring**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	57%	of	Appren	tice	Wage	for all	intervals	+ \$0.54		

**Ratio of Apprentices to Journeymen - \***

\* 1 apprentice shall be allowed to every 2 journeymen or major fraction thereof. 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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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**

	09/24/20
Foreman	W45.05 B27.06 T72.11
General Foreman	W49.14 B27.55 T76.69
Journeyman	W40.95 B26.56 T67.51

**Craft: Commercial Painter- New Construction**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	45%	55%	65%	70%	75%	80%	80%		
6 Months										
Benefits	8.05	8.05	10.05	10.05	11.05	11.05	14.05	14.05		

**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,

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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**

	09/24/20
Foreman	W33.11 B20.66 T53.77
General Foreman	W34.61 B20.66 T55.27
Journeyman	W30.10 B20.66 T50.76

**Craft: Commercial Painter- Repainting**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	COMME	CIAL	PAINTER	NEW	CONSTR	TION			
		R				UC				

**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: Dockbuilder                      PREVAILING WAGE RATE**

	05/05/20
Foreman	W55.78 B48.47 T104.25
Foreman (Concrete Form Work)	W54.97 B35.36 T90.33
Journeyman	W48.50 B48.47 T96.97
Journeyman (Concrete Form Work)	W47.80 B35.36 T83.16

**Craft: Dockbuilder                      APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
Yearly	19.40	24.25	31.53	38.80						
Benefit	32.07	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	19.12	23.90	31.07	38.24
Benefits	24.16	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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

**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**

	09/24/20
Foreman	W44.43 B27.06 T71.49
General Foreman	W46.45 B27.06 T73.51
Journeyman	W40.39 B27.06 T67.45

**Craft: Drywall Finisher**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	50%		60%	70%		80%	90%		
6 Months										
Benefits	Intervals	1 to 2 =	10.65	Intervals	3 to 4 =	13.41	Intervals	5 to 6 =	16.63	

**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**

	06/01/20	05/31/21
Cable Splicer	W63.83 B37.99 T101.82	W64.92 B39.29 T104.21
Foreman (11-20 Journeymen)	W67.90 B40.41 T108.31	W69.05 B41.78 T110.83
Foreman (1-3 Journeymen)	W63.83 B37.99 T101.82	W64.92 B39.29 T104.21
Foreman (4-10 Journeymen)	W66.74 B39.72 T106.46	W67.87 B41.07 T108.94
General Foreman (21-30 Journeymen)	W69.64 B41.44 T111.08	W70.82 B42.85 T113.67
General Foreman (31-60 Journeymen)	W75.44 B44.89 T120.33	W76.72 B46.42 T123.14
General Foreman (61+ Journeymen)	W76.60 B45.58 T122.18	W77.90 B47.13 T125.03
Journeyman	W58.03 B34.54 T92.57	W59.02 B35.72 T94.74
Sub-Foreman	W66.16 B39.37 T105.53	W67.28 B40.71 T107.99

**Craft: Electrician**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
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**

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

**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**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>										
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.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

- 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 (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**

	06/01/20	05/31/21
Cable Splicer	W64.14 B37.69 T101.83	W65.22 B38.97 T104.19
Certified Welder	W61.22 B35.97 T97.19	W62.26 B37.21 T99.47
Equipment Operator	W58.31 B34.26 T92.57	W59.29 B35.43 T94.72
Foreman (1-3 Journeymen workers on job)	W64.14 B37.69 T101.83	W65.22 B38.97 T104.19
Foreman (4-10 Journeymen workers on job)	W67.06 B39.40 T106.46	W68.19 B40.75 T108.94
General Foreman (11-20 Journeymen workers on job)	W68.22 B40.08 T108.30	W69.37 B41.45 T110.82
General Foreman (21-30 Journeymen workers on job)	W69.97 B41.11 T111.08	W71.16 B42.52 T113.68
General Foreman (31-60 Journeymen workers on job)	W75.80 B44.54 T120.34	W77.08 B46.06 T123.14
General Foreman (61+ Journeymen workers on job)	W76.96 B45.22 T122.18	W78.27 B46.77 T125.04
Groundman	W34.99 B20.56 T55.55	W35.58 B21.26 T56.84
Journeyman Lineman/Technician	W58.31 B34.26 T92.57	W59.29 B35.43 T94.72
Sub-Foreman	W66.47 B39.06 T105.53	W67.60 B40.40 T108.00

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

**Craft: Electrician- Outside Commercial**

**APPRENTICE RATE SCHEDULE**

<b>INTERVAL</b>	<b>PERIOD AND RATES</b>									
1000 Hours	60%	65%	70%	75%	80%	85%	90%			
Benefits	57.75% of	Journey	man	wage	+	\$.01				

**Craft: Electrician- Outside Commercial**

**COMMENTS/NOTES**

EFFECTIVE 6-1-20- The apprentice benefit rate shall be 58.75% + \$.01.  
EFFECTIVE 5-31-21- The apprentice benefit rate shall be 59.75% + \$.01.

\* 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**

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

	03/17/20	03/17/21	03/17/22	03/17/23
Journeyman	W54.56	W56.77	W59.09	W60.89
	B40.86	B41.82	B42.79	B44.41
	T95.42	T98.59	T101.88	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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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**

	09/24/20
* Leadman	W48.80 B27.31 T76.11
Foreman	W50.80 B27.55 T78.35
General Foreman	W52.80 B27.79 T80.59
Journeyman	W46.80 B27.07 T73.87

**Craft: Glazier                      APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
6 Months	50%	55%		60%	65%		70%	75%		
Benefits	Intervals	1 to 2 =	9.50	Intervals	3 to 4 =	12.11	Intervals	5 to 6 =	15.60	

**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

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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	W36.89
Abatement	B24.92
	T61.81

**Craft: Heat & Frost Insulator - Asbestos Worker**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	HEAT &	FROST	INSULAT OR						

**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									
	60%	70%	80%	90%						
6 Months										
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 facilities, 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

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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 facilities, 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 facilities, 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**

	07/24/20
Rod /Fence Foreman	W46.14 B48.12 T94.26
Rod/Fence Journeyman	W43.14 B48.12 T91.26
Structural Foreman	W48.44 B48.12 T96.56
Structural Journeyman	W45.44 B48.12 T93.56

**Craft: Ironworker                      APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
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:**

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

- 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**

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**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
	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

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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**

substituted for the day after Thanksgiving.



**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 - New Construction**

**PREVAILING WAGE RATE**

	09/24/20
Foreman	W45.05 B26.56 T71.61
Journeyman	W40.95 B26.56 T67.51

**Craft: Paperhanger - New Construction**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	COMME R	CIAL	PAINTER	NEW	CONSTR UC	TION			

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Paperhanger - New Construction**

**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: Paperhanger - Renovation**

**PREVAILING WAGE RATE**

	09/24/20
Foreman	W33.94 B20.70 T54.64
Journeyman	W30.86 B20.70 T51.56

**Craft: Paperhanger - Renovation**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
		SEE	COMME R	CIAL	PAINTE R	NEW	CONSTR UC	TION		

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Paperhanger - Renovation**

**COMMENTS/NOTES**

NOTE: These rates may only be used on jobs where no major alterations 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, elevated tanks, or generating stations.

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Paperhangers on a job, 1 shall be designated a Foreman.

**OVERTIME:**

- Hours in excess of 8 per day and 40 per week shall be paid at time and one-half the regular rate.

- Four 10-hour days may be worked, at straight time, Monday through Sunday.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**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**

	05/01/20
Foreman	W60.69 B37.32 T98.01
General Foreman	W64.62 B37.32 T101.94
Journeyman	W56.19 B37.32 T93.51

**Craft: Plumber                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	30%	45%	55%	65%	75%					
Benefits	14.31	20.83	22.72	24.52	26.50					

**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 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 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**

	06/04/20
Foreman	W42.77 B28.03 T70.80
Journeyman	W39.77 B28.03 T67.80

**Craft: Roofer                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	15.90	19.89	23.86	27.84	31.82	35.79				
Benefits	2.10	2.10	25.28	25.28	25.28	25.28				

**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**

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES ENTERING PROGRAM AFTER 4-1-17:

INTERVAL	PERIOD AND RATES								
6 Months	15.90	19.89	23.86	25.85	27.84	29.83	31.82	35.79	
Benefits	2.10	2.10	25.28	25.28	25.28	25.28	25.28	25.28	

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**

	04/16/20
Foreman	W38.29 B35.55 T73.84
Journeyman	W36.79 B35.55 T72.34

**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	12.03	13.71	15.39	17.09	19.21	20.92	22.65	24.38	26.10	27.82

**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 through 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**

	06/09/20
Foreman	W53.62 B46.85 T100.47
General Foreman	W54.62 B46.85 T101.47
Journeyman	W50.12 B46.85 T96.97

**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: Tile Finisher-Marble                      PREVAILING WAGE RATE**

	01/04/21
Finisher	W48.27 B35.40 T83.67

**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**

	12/07/20
Finisher	W46.69 B31.56 T78.25
Setter	W60.86 B34.74 T95.60

**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**

	01/04/21
Tile Setter	W60.89 B37.80 T98.69

**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**

	01/01/21
Grinder or Assistant	W56.32 B37.76 T94.08
Mechanic	W57.92 B37.78 T95.70
Terrazzo Resinous Worker	W48.55 B30.40 T78.95

**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**

	05/01/20
Bucket, Utility, Pick-up, Fuel Delivery trucks	W39.21 B38.05 T77.26
Dump truck, Asphalt Distributor, Tack Spreader	W39.21 B38.05 T77.26
Euclid-type vehicles (large, off-road equipment)	W39.31 B38.05 T77.36
Helper on Asphalt Distributor truck	W39.21 B38.05 T77.26
Slurry Seal, Seeding/Fertilizing/ Mulching truck	W39.21 B38.05 T77.26
Straight 3-axle truck	W39.21 B38.05 T77.26
Tractor Trailer (all types)	W39.31 B38.05 T77.36
Vacuum or Vac-All truck (entire unit)	W39.21 B38.05 T77.26
Winch Trailer	W39.41 B38.05 T77.46

**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.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - UNION**

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 \$36.80.
- As of 5-1-20, benefits on overtime shall be \$37.80.

**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**

	04/01/20
Driver	W25.60 B15.71 T41.31

**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

**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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
53.23	34.50	87.73	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 additional \$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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
53.23	34.50	87.73	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
51.32	34.50	85.82	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 (Hetzl, Rexomatic & similar types)
- Concrete Vibrator

**OPERATING ENGINEERS**      **Rates Expiration Date :**

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
51.32	34.50	85.82	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
51.32	34.50	85.82	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

Skimmer Machine (boom type)

Steel Cutting Machine (service & maintenance)

Tamrock Drill

Tractor

Transfer Machines

**OPERATING ENGINEERS**      **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
51.32	34.50	85.82	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
47.98	34.50	82.48	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
45.40	34.50	79.90	82.20	84.45

**CLASSIFICATIONS:**

Field Engineer - Rodman or Chainman

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

OPERATING ENGINEERS      Rates Expiration Date :

Effective Dates:

	07/01/2020		07/01/2021	07/01/2022
Rate	Fringe	Total	Total	Total
55.56	34.50	90.06	92.36	94.61

**CLASSIFICATIONS:**

Lead Engineer, Foreman Engineer, Safety Engineer (minimum)

**OPERATING ENGINEERS**     **Rates Expiration Date :**

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
54.82	34.50	89.32	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

Helicopter Co-Pilot

Helicopter Communications Engineer

Juntann Pile Driver

Locomotive (large)

Mucking Machine

**OPERATING ENGINEERS**      **Rates Expiration Date :**

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
54.82	34.50	89.32	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
49.69	34.50	84.19	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
49.69	34.50	84.19	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 propane, 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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
56.64	34.50	91.14	93.44	95.69

**CLASSIFICATIONS:**

Helicopter Pilot/Engineer

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
61.32	34.50	95.82	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
60.32	34.50	94.82	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
56.82	34.50	91.32	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
59.32	34.50	93.82	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
55.82	34.50	90.32	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
58.45	34.50	92.95	95.25	97.50

**CLASSIFICATIONS:**

Helicopter Co-Pilot & Communications Engineer

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

**STRUCTURAL STEEL ERECTION**      **Rates Expiration Date :**

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
54.39	34.50	88.89	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
51.73	34.50	86.23	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
50.20	34.50	84.70	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
48.44	34.50	82.94	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
56.01	34.50	90.51	92.81	95.06

**CLASSIFICATIONS:**

Lead Engineer, Foreman Engineer, Safety Engineer (Minimum)

**Effective Dates:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
45.40	34.50	79.90	82.20	84.45

**CLASSIFICATIONS:**

Field Engineer - Rodman or Chainman

**STRUCTURAL STEEL ERECTION**      **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
55.15	34.50	89.65	91.95	94.20

**CLASSIFICATIONS:**

Field Engineer-Chief of Party

Vacuum Truck

**Effective Dates:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
63.34	34.50	97.84	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
61.68	34.50	96.18	98.48	100.73

**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), 100 tons and over and Tower Crane.

**Effective Dates:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
58.84	34.50	93.34	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:**

<b>07/01/2020</b>			<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
57.18	34.50	91.68	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.

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NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
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STRUCTURAL STEEL ERECTION      Rates Expiration Date :

Effective Dates:

	07/01/2020		07/01/2021	07/01/2022
Rate	Fringe	Total	Total	Total
58.84	34.50	93.34	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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
54.82	34.50	89.32	91.62	93.87

**CLASSIFICATIONS:**

Driller

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
47.98	34.50	82.48	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)

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**FREE AIR TUNNEL JOBS**      **Rates Expiration Date :**

**Effective Dates:**

	<b>03/03/2021</b>		<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
53.57	34.50	88.07	90.37	92.62

**CLASSIFICATIONS:**

Driller

**Effective Dates:**

	<b>07/01/2020</b>		<b>07/01/2021</b>	<b>07/01/2022</b>
Rate	Fringe	Total	Total	Total
47.33	34.50	81.83	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

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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: + \$3.00/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
48.00	33.23	81.23	82.53	86.28	89.78

**CLASSIFICATIONS:**

Paving Foreman

**Effective Dates:**

	03/10/2021		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:**

	03/10/2021		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:**

Screedman



**ASPHALT LABORERS - SOUTH**     **Rates Expiration Date :**

**Effective Dates:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
Rate	Fringe	Total	Total	Total	Total
44.00	33.23	77.23	78.53	81.28	83.78

**CLASSIFICATIONS:**

Milling Controller

**Effective Dates:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
Rate	Fringe	Total	Total	Total	Total
44.20	33.23	77.43	78.73	81.48	83.98

**CLASSIFICATIONS:**

Traffic Control Coordinator

**Effective Dates:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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.

**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
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:**

<b>03/03/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/03/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
Rate	Fringe	Total	Total	Total	Total
48.00	33.23	81.23	82.53	85.28	87.78

**CLASSIFICATIONS:**

"A" Rate:

blaster

**Effective Dates:**

<b>03/03/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/03/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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.

**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:**

	03/10/2021		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 coatiers 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:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
Rate	Fringe	Total	Total	Total	Total
48.00	33.23	81.23	82.53	85.28	87.78

**CLASSIFICATIONS:**

blaster

**Effective Dates:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

<b>03/10/2021</b>			<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
Rate	Fringe	Total	Total	Total	Total
46.75	33.23	79.98	81.28	85.03	88.53

**CLASSIFICATIONS:**

general foreman

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

**HEAVY & GENERAL LABORERS - SOUTH**      **Rates Expiration Date :**

**Effective Dates:**

	<b>03/10/2021</b>		<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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:**

**06/09/2020**

Rate	Fringe	Total
54.58	32.80	87.38

**CLASSIFICATIONS:**

Pipeline Journeyman Welder



TERRITORY  
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PIPELINE - MAINLINE TRANSMISSION      Rates Expiration Date :

Effective Dates:

**06/09/2020**

Rate	Fringe	Total
54.58	32.80	87.38

**CLASSIFICATIONS:**

Pipeline Journeyman

Effective Dates:

**06/09/2020**

Rate	Fringe	Total
33.27	22.42	55.69

**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:**

	<b>11/02/2020</b>		<b>11/01/2021</b>	<b>11/01/2022</b>
Rate	Fringe	Total	Total	Total
61.50	27.23	88.73	91.23	93.73

**CLASSIFICATIONS:**

Pipeline Journeyman Welder

**Effective Dates:**

	<b>11/02/2020</b>		<b>11/01/2021</b>	<b>11/01/2022</b>
Rate	Fringe	Total	Total	Total
61.50	27.23	88.73	91.23	93.73

**CLASSIFICATIONS:**

Pipeline Journeyman

**Effective Dates:**

	<b>11/02/2020</b>		<b>11/01/2021</b>	<b>11/01/2022</b>
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: + \$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
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

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

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 workday 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

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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 workday 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 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

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ENTIRE STATE

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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)

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

**HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS**      **Rates Expiration Date :**

**Effective Dates:**

	<b>03/03/2021</b>		<b>09/01/2021</b>	<b>03/01/2022</b>	<b>03/01/2023</b>
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)

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## **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. Phased construction.
4. Work performed by Owner.
5. Owner-furnished/Contractor-installed (OFICI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

#### **1.3 DEFINITIONS**

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

#### **1.4 PROJECT INFORMATION**

- A. Project Identification: Union County Dispatch Center Area Expansion, PS&S # 030090002
  1. Project Location: Froehlich Building - North Avenue Westfield, NJ.
- B. Owner: County of Union / Division of Engineering.

- C. Architect: Paulus Sokolowski and Sartor Engineering, PC, 3 Mountainview Road, Warren, NJ

### **1.5 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. Union County Dispatch Center Expansion in the Froehlich Building and renovation work in the Vehicle Storage Building on the same site. Refer to work as defined on the contract documents. Work includes interior renovation work modifications on the site which includes a new generator and transformer, and other Work indicated in the Contract Documents.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.

### **1.6 PHASED CONSTRUCTION**

- A. Construct the Work in phases, with each phase substantially complete as indicated on Drawings or as defined the contract with the owner.
1. Phase 1 includes work associated with the Froehlich Building, the Vehicle Storage Building and associated site work as defined by the contract documents.
  2. The existing 911 dispatch area must remain in operation 24/7 until Phase 1 is fully operational. It is the General Contractors responsibility to provide all coordination and cost for temporary power and services required to fulfill this requirement.
  3. Phase 2 includes work associated with the Froehlich Building and associated site work as defined by the contract documents.
    - a. Commencement of Construction:
      - 1) Notice to Proceed: Work of this phase shall commence within the number of days as defined by the contract and/or the Notice to Proceed.
    - b. Substantial Completion:
      - 1) Within the number of days as defined by the contract and/or the Notice to Proceed.
- B. Before commencing Work of each phase, submit an updated copy of Contractor's (COM) construction schedule, showing the sequence, commencement, and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

**1.7 WORK PERFORMED BY OWNER**

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

**1.8 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFICI) PRODUCTS**

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
  2. Provide for delivery of Owner-furnished products to Project site.
  3. Upon delivery, inspect, with Contractor present, delivered items.
    - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
  4. Obtain manufacturer's inspections, service, and warranties.
  5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
  2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
  3. Receive, unload, handle, store, protect, and install Owner-furnished products.
  4. Make building services connections for Owner-furnished products.
  5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
  6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFICI) Products:
1. Electronic Display devices
  2. Other items as defined by the Owner or as defined on the contract documents
- D. Owner-Responsibility/Contractor Installed (ORCI) Products:
1. Owners vendor will install card access devices and wiring; General Contractor is responsible for providing and installing conduit and back-box in walls for card access devices.



## **1.9 CONTRACTOR'S USE OF SITE AND PREMISES**

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits on Use of Site: Confine construction operations to areas where work is defined or permitted. Review limits of work with Owner and Owners representative to minimize disruption to the site and Owners daily activities.
  - 2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 15 feet beyond surface walkways, patios, surface parking, and utilities; and 25 feet beyond constructed areas with permeable surfaces that require additional staging areas to limit compaction in the constructed areas.
  - 3. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

## **1.10 COORDINATION WITH OCCUPANTS**

- A. Full Owner Occupancy: Owner will occupy Project site and existing adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
  - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
  - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
  - 2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
  - 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

#### **1.11 WORK RESTRICTIONS**

- A. Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.
  - 1. Weekend Hours: Per Owner's Approval.
  - 2. Early Morning Hours: Per Owner's Approval
  - 3. Late Evening Hours: Per Owner's Approval
  - 4. Hours for Utility Shutdowns and Equipment Rigging: Weekend Hours.
  - 5. Hours for core drilling and other noisy work: Weekday Hours of 7:00 a.m. to 8:00 a.m. and 6:00 p.m. to 10:00 p.m. where compliant with the County of Union.
- 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 Owner not less than ten (7) 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 Owner not less than five (3) days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- F. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building on Project site on Owner's property is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Always require personnel to use identification tags.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
  - 1. Maintain list of approved screened personnel with Owner's representative.

#### **1.12 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. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Owners General Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. 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.
  - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

#### **PART 2 - PRODUCTS (Not Used)**

#### **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 011000**

## **SECTION 011100 - PROJECT SCHEDULE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes, but is not limited to, the following:
1. Work Sequence.
  2. Contractor's Construction Schedule Submittal.
  3. Contractor's use of premises.
  4. Owner Occupancy.

#### **1.2 WORK SEQUENCE**

- A. Project Start: Commence construction activity at the site as soon after contract award as required to comply with specified Construction Schedule, unless otherwise specified in Construction Schedule below.
1. Schedule material deliveries to correspond with starting dates so that materials are on site on required start date.
  2. The ordering of equipment and the expediting of delivery of such is the responsibility of the Contractor.
  3. As soon as possible after signing this contract, the Contractor shall place orders for materials and equipment necessary to complete this contract after submittals have been reviewed and approved by the Architect or Engineer, and construction manager.
  4. Color Selection: Within 30 days after contract award max, submit complete list of proposed manufacturers and complete product designations (i.e. model, grade, series, product line, etc.) for each item requiring color selection by Architect.
- B. Contractor shall coordinate his work scheduling with other sub-contractors, utility companies and shall be responsible for maintaining work continuity. No claims for delay will be considered when said claims are based on physical or schedule interferences with sub-contractors, or when Owner caused interferences require this Contractor to temporarily relocate his working area to another portion of the contract space.
- C. Provide a work force adequate in number to complete the project in the proper time and in the proper sequence to allow all other work to proceed without delay.
- D. If the completion of the job is unnecessarily delayed because of the failure of the Contractor to properly execute the work or ordering of material, he shall be required to install, at his own expense, any temporary work required by the Owner to maintain the project completion schedule.
- E. Coordination:
1. Schedule all construction activities at Site with Architect and Owner's Representative, to avoid, to maximum extent, interference with Owner's operations and to meet specified completion dates. It is responsibility of the Contractor to meet the Construction Schedule within Owner's Schedule.

- a. Coordinate construction activities through the Architect and Owner's Representative with the Owner's calendar issued by Owner to the Contractor to avoid interference with Owner's schedule / process and operations within building.
  - b. Review Contract Document requirements in relationship to requirements for other Contractors and Owner's Schedule.
2. Coordinate all interruptions of building services, shut-down of building systems or testing of building systems, through the Construction Manager, Architect and Owner's Representative, and obtain, through the Construction Manager, Architect and Owner's Representative, written approval of proposed schedule for interruptions, shut-down or testing from Construction Manager, Architect and Owner. 72 - hour advanced notice from the contractor to the Construction Manager and owner is required for all service turn overs and shutdowns. Contractor shall provide temporary services for all services to avoid shutdowns. Owner will approve or disapprove request with comments as required.
- a. If, in Owner's opinion, any such interruption or shut-down will affect life safety of building occupants or operations, the scheduled interruption or shut-down shall be adjusted to a time acceptable to Owner, at time when operations are not in session, or after normal working hours. Coordinate all changes through the Construction Manager, Architect and Owner's Representative.
  - b. Owner will not make extra payment for overtime outside normal working hours required by any such interruption or shutdown. If the Contractor requires overtime, they shall do so at their cost and shall be responsible for extra costs incurred by their Sub Contractors as a result.
  - c. Ensure all equipment, fittings, pipe, and similar items required are available before temporary service tie-ins are turned over and interrupting or shutting-down existing systems.
  - d. Notify all inspectors and representatives of utility companies, township, county, etc..., officials, Owner's Representative, Architect, Owner, and similar parties by letter in advance of required changeovers, tie-ins, removals, and similar operations.

F. Construction Schedule:

1. Refer to "Project Milestone Schedule" Attachment #1
2. Provide Schedule as required by Construction Manager, Architect, and Owner. Format may be in a bar graph schedule or CPM schedule as approved by Construction Manager, Architect, and Owner.
3. Provide Submittal Schedule with anticipated dates for Product Submission and coordinate dates with Construction Schedule. Refer to Division 01 – Submittals for more information.

**1.3 CONTRACTOR'S CONSTRUCTION SCHEDULE SUBMITTAL**

A. Contractor shall prepare a Construction Schedule submittal in accordance with the General Conditions and contract documents for the entire amount of Work in the Prime Contract in accordance with the following requirements:

1. The Contractor shall prepare a Project Progress Schedule in the form of a graphic Planning System Software package (CPM schedule), for coordinating and controlling the Project Work. (Similar to Microsoft Projects, Primavera, or approved equal). The

contractor shall be responsible for the overall coordination of the Project Work and updating of the schedule to illustrate the current rate of Project Progress.

2. Submit (4) copies of the initial schedule and each revision to the Construction Manager, Architect, Owner, Owner's Representative for their use.

#### **1.4 CONTRACTOR USE OF PREMISES**

- A. Access to Building - Contractor: Schedule all construction activities with Owner through the Construction Manager / Owner's Representative to allow Owner's full use of building areas and systems for normal operation and occupancy process.
  1. Owner acknowledges Contractors will require access to Owner-occupied spaces, areas, rooms, and systems, and intends to cooperate where practical in making rooms and systems available for construction activities.
  2. Notify Owner's Representative in advance of any requirements for access to the existing building while the space is occupied or outside normal working hours and days.
  3. All contractors' personnel must fulfill required background check requirements noted in Section 013100. All contractors to produce and wear ID Badges at all times while on site. Badges must have Company Name, Photo ID, and individuals Name as required by the Owner.
- B. Building Security: Owner will maintain building security at all times for their sole benefit. The Contractor retains full responsibility for security and protection of Work and equipment of his Contract until final acceptance by Owner.
- C. Maintenance of Building Circulation and Exits: Maintain circulation corridors, exits, and exit stairs unobstructed from equipment and materials, except in areas of construction activity enclosed by temporary partitions. Egress plans must meet the approval of the local code official.
- D. "Noise" shall be defined as the noise generated from any power equipment, any power machine, or the noise created by providing blunt force to an object from another object. Contractor shall keep "Noise" to a minimum during testing or other occupancy times that may be disruptive to the Owner use of the building.

#### **1.5 OWNER OCCUPANCY**

- A. Normal Year - Owner intends to maintain full operational program during the normal year throughout duration of Project, and will make full use of buildings and sites, unless otherwise specified.
  1. The buildings will be used for day and evening functions during the year.
  2. The Contractor shall maintain free access for Owner's personnel to building and site areas not scheduled for alteration or dimensional change. Refer to "Project Milestone Schedule".
  3. Owner's personnel will perform normal custodial and maintenance services for building areas and systems not involved in construction activities, unless otherwise indicated. Safe access and egress to and from the building will be provided.
  4. The contractor is required to provide a clear, free and accessible route to access and exit the spaces affected by the work activities and identified by the Owner, Architect, Construction Manager, and Code official. Contractor is to keep all exit access paths and

- exit doors in the building clear of any obstructions. This will include all temporary measures, including but not limited to, temporary partitions, ramps, walks, guards, hardware, doors, and lighting / electrical systems.
5. The Contractor shall coordinate work activities around the Owner's occupancy dates to prevent noise and disruption to the Owners activities. The Contractor shall always maintain clear access and egress for buildings involved in this Project.
  6. Building work hours:
    - a. Building Work hours: Owner will occupy building Monday thru Friday; Saturday and Sunday. Weekend, before hours and afterhours access will be provided on a limited basis upon request in writing and approval of Owner and Construction Manager.
      - 1) Normal business hours - 7:00AM thru 4:00PM
      - 2) Duration of work hours may be adjusted for outdoor work to meet the local zoning ordinance restrictions including noise.
      - 3) Contractor will propose adjustments to this schedule which will be considered, approved, or denied by the Owner and Construction Manager upon written request.
      - 4) **All noisy masonry demolition work to be completed before or after normal business hours and coordinated with the owner per the project manual.**
  7. **The Owner will not pay for overtime to the contractor for any work performed beyond normal business hours during the calendar year.**
  8. If work progress is delayed or behind to complete the project within the projected time / schedule, the contractor will be required to work during afterhours (Monday thru Friday after 4:00PM; work performed during the weekday will be performed at no additional cost to the Owner. Weekends (Sat and Sun) can be scheduled for work with 72-hour advanced written notice to the Owner. Weekend hours will be performed at no additional cost to the Owner. The Owner will not pay for overtime to the contractor for work performed after hours.

**PART 2 – PRODUCTS - NOT USED.**

**PART 3 – EXECUTION - NOT USED.**

END OF SECTION

## **SECTION 012100 - ALLOWANCES**

### **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 governing allowances.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
- C. Related Requirements:
  - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
  - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.
  - 3. Refer to Bid Form B-4 to formalize allowance figures as part of the bid.

#### **1.3 DEFINITIONS**

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

#### **1.4 CONTINGENCY ALLOWANCES**

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.



- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

**3.2 PREPARATION**

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

**3.3 SCHEDULE OF ALLOWANCES**

- A. Allowance No. 1: Contingency Allowance: Include a Bid contingency allowance of \$315,000.00 within the base bid contractor amount for use according to Owner's written instructions.
- B. Allowance No. 2: Contingency Allowance: Include a contingency allowance of \$5,000.00 for 3<sup>rd</sup> party Testing & Inspections (for steel welding, concrete, etc.) within the base contract amount for use according to Owner's written instructions.
- C. Allowance No. 3: Contingency Allowance: Include a contingency allowance of \$160,000.00 for Millwork, Furniture & Locker Allowance (For Rooms 108, 109, 110, 112, 116, & 122) within the base contract amount for use according to Owner's written instructions.
  - 1. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.

**END OF SECTION 012100**

## **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. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 016000 "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.
  - 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 to meet other Project requirements but may offer advantage to Contractor or Owner.

#### **1.4 ACTION SUBMITTALS**

- A. Substitution Requests: Submit documentation identifying 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 form acceptable to Architect.
  - 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 code organizations noted in the contract documents.
  - 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, cost comparison to the product specified, including a proposal of change and the cost benefit to the Owner, 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.
  - n. Contractor will be responsible for the cost of fees / design changes required to be performed by the design professional to accommodate the proposed substitution into the scope of the work.
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 through Construction Manager 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. Requested substitution provides sustainable design characteristics that specified product provided for compliance with project sustainability requirements.
    - c. Substitution request is fully documented and properly submitted.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work and does not impact other scope of work items.
    - h. Requested substitution provides specified warranty.
    - i. 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: Consultant will consider requests for substitution if received within 15 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Consultant.
  - 1. Conditions: Consultant will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect's / Engineer's Consultant will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect's/Engineer's Consultant for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. 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

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 012500**

## **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. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
  - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

#### **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 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 ten days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of 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. Owner's name.
  - c. Owner's Project number.
  - d. Name of Architect.
  - e. Architect's Project number.
  - f. Contractor's name and address.
  - g. 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. Related Specification Section or division.
  - b. Description of the Work.
  - c. Change Orders (numbers) that affect value.
  - d. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
    - 1) Labor.
    - 2) Materials.
4. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
5. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
6. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

## **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 Construction Manager and paid for by Owner.
- B. Payment Application Times: Submit Application for Payment to Architect by the 21st day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect Construction Manager and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect Construction Manager 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.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
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 Construction Manager by a method ensuring receipt. 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 subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  2. 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.
  3. Contractor's construction schedule (preliminary if not final).
  4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  5. Products list (preliminary if not final).
  6. Sustainable design action plans, including preliminary project materials cost data.
  7. Schedule of unit prices.
  8. Submittal schedule (preliminary if not final).
  9. List of Contractor's staff assignments.
  10. List of Contractor's principal consultants.
  11. Copies of building permits.
  12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  13. Initial progress report.
  14. Report of preconstruction conference.
  15. Certificates of insurance and insurance policies.
  16. Performance and payment bonds.
  17. Data needed to acquire Owner's insurance.
- 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.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
  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. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Maintenance Bond if applicable with general & supplementary conditions of the contract.
5. Updated final statement, accounting for final changes to the Contract Sum.
6. AIA Document G706.
7. AIA Document G706A.
8. AIA Document G707.
9. Evidence that claims have been settled.
10. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
11. Final liquidated damages settlement statement if applicable.
12. Proof that taxes, fees, and similar obligations are paid.
13. Waivers and releases.

**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. Background check requirements for all contractors.
  - 3. Coordination drawings.
  - 4. RFIs.
  - 5. Digital project management procedures.
  - 6. Web-based Project management software package.
  - 7. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### **1.3 DEFINITIONS**

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Construction Manager, 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, telephone number, and email address 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, 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, in web-based Project software directory, and in prominent location in each built facility. Always keep list current.

#### **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.
  4. The General Contractor shall coordinate its own operations with all sub-contractors and the Owner operations. This shall include work defined in different Sections of the contract documents that depend on each other for proper installation, sequence, connection, installation, and operation.
- 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 and scheduled activities of other contractors and direction of Project coordinator 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. Preinstallation conferences.
  7. Project closeout activities.

## **1.6 BACKGROUND CHECK REQUIREMENTS**

- A. It is the requirement of the County of Union that ALL contractors (both General Contractors and their sub-contractors) and their personnel be vetted through a fingerprint based background check process prior to being permitted entry into the County facility(s) and the commencement of the proposed work.
- B. It is the responsibility of the General Contractor or vendor in charge, to make sure that all personnel who will be working in and around the County facility contact the State of New Jersey, Department of Law & Public Safety, Division of State Police Criminal Information Unit at (609) 822-2000, Ext. 2918 or visit their website at <https://njsp.org/criminal-history-records/> and follow the instructions to obtain a copy of each person's "Individual Criminal History Record".
- C. **PLEASE NOTE: ALL FEES & TIME ASSOCIATED IN COMPLETING THIS PROCESS ARE THE SOLE RESPONSIBILITY OF THE APPLICANT AND/OR THEIR AFFILIATES (E.G. GENERAL CONTRACTOR AND/OR SUBCONTRACTORS).**
- D. Once obtained, original sealed records (no copies) shall be sent/delivered to the Union County Sheriff's Office at the following address:
1. Union County Sheriff's Office; 2 Broad Street, Control Center; Elizabeth, NJ 07207; 908-527-4440
- E. Upon completion of the review and processing of the information received, the Union County Sheriff's Office will issue identification cards to all contractors' personnel authorized into the County facility to conduct work activities. It is the responsibility of the General Contractor or vendor in charge of the proposed work to maintain a current and accurate list of; any and all; screened and approved personnel with the Union County Sheriff's Office.
- F. **THE COUNTY OF UNION SHALL NOT BE RESPONSIBLE FOR ANY DELAYS AND/OR DAMAGES EITHER DIRECTLY OR INDIRECTLY RESULTING FROM THE FAILURE TO COMPLY WITH THESE REQUIREMENTS BY ANY GENERAL CONTRACTOR OR VENDOR IN CHARGE.**

## **1.7 COORDINATION DRAWINGS**

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate sub-framing for support of ceiling, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger including bundled runs of conduit.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    - d. Location of pull boxes and junction boxes dimensioned from column center lines.
  8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
  10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
  2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
  3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
  4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
  5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.

6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
  7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
    - a. Same digital data software program, version, and operating system as original Drawings.
    - b. DWG, current version as defined by the design professional operating in Microsoft Windows operating system.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format or PDF format if approved by the design professional.
  3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

## **1.8 REQUEST FOR INFORMATION (RFI)**

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner 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. Owner name.
  3. Owner's Project number.
  4. Name of Architect and Construction Manager.
  5. Architect's Project number.
  6. Name of Contractor.
  7. RFI number, numbered sequentially.
  8. RFI subject.
  9. Specification Section number and title and related paragraphs, as appropriate.



10. Drawing number and detail references, as appropriate.
  11. Field dimensions and conditions, as appropriate.
  12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  13. Contractor's signature.
  14. 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: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect or Construction Manager 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 by Architect or Construction Manager 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 Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 5 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. Use software log that is part of web-based Project management software. Include the following: Software log with not less than the following:
1. Project name.
  2. Name and address of Contractor.

3. Name and address of Architect and Construction Manager.
  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 and Construction Manager's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within three days if Contractor disagrees with response.

## **1.9 DIGITAL PROJECT MANAGEMENT PROCEDURES**

- A. Use of Architect's Digital Data Files: Digital data files of Architect's electronic drawings will be provided by Architect for Contractor's use during construction.
1. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect (including an Indemnification Agreement).
    - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
    - b. Contractor to define drawing format / software, and files required.
    - c. An administrative processing fee of \$300 will be paid by the party making the request to the design professional for each individual request.
  2. The following digital data files may be furnished upon request for each appropriate discipline:
    - a. Floor plans.
    - b. Reflected ceiling plans.
- B. Web-Based Project Management Software Package: Use Architect's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
1. Web-based Project management software includes, at a minimum, the following features:
    - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    - b. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.

2. Provide up to seven Project management software user licenses for use of Owner, Construction Manager, Architect, and Architect's consultants. Software training at Architect's office for web-based Project software users can be arranged upon request.
  3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare 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.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

#### **1.10 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 a minimum of seven days prior to meeting.
  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, Construction Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: 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. Attendees: Authorized representatives of Owner, Construction Manager, 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.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Phasing.
    - d. Critical work sequencing and long lead items.
    - e. Designation of key personnel and their duties.
    - f. Lines of communications.
    - g. Use of web-based Project software.
    - h. Procedures for processing field decisions and Change Orders.

- i. Procedures for RFIs.
  - j. Procedures for testing and inspecting.
  - k. Procedures for processing Applications for Payment.
  - l. Distribution of the Contract Documents.
  - m. Submittal procedures.
  - n. Sustainable design requirements.
  - o. Preparation of Record Documents.
  - p. Use of the premises and existing building.
  - q. Work restrictions.
  - r. Working hours.
  - s. Owner's occupancy requirements.
  - t. Responsibility for temporary facilities and controls.
  - u. Procedures for moisture and mold control.
  - v. Procedures for disruptions and shutdowns.
  - w. Construction waste management and recycling.
  - x. Parking availability.
  - y. Office, work, and storage areas.
  - z. Equipment deliveries and priorities.
  - aa. First aid.
  - bb. Security.
  - cc. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Sustainable Design Requirements Coordination Conference: Construction Manager will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, Construction Manager, Architect, and Contractor.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; 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.
  2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:
    - a. Sustainable design Project checklist.
    - b. General requirements for sustainable design-related procurement and documentation.
    - c. Project closeout requirements and sustainable design certification procedures.
    - d. Role of sustainable design coordinator.
    - e. Construction waste management.
    - f. Construction operations and sustainable design requirements and restrictions.
  3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Sustainable design requirements.
    - i. Review of mockups.
    - j. Possible conflicts.
    - k. Compatibility requirements.
    - l. Time schedules.
    - m. Weather limitations.
    - n. Manufacturer's written instructions.
    - o. Warranty requirements.
    - p. Compatibility of materials.
    - q. Acceptability of substrates.
    - r. Temporary facilities and controls.
    - s. Space and access limitations.
    - t. Regulations of authorities having jurisdiction.
    - u. Testing and inspecting requirements.
    - v. Installation procedures.
    - w. Coordination with other work.
    - x. Required performance results.
    - y. Protection of adjacent work.
    - z. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

- E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for completing sustainable design documentation.
    - f. Requirements for preparing operations and maintenance data.
    - g. Requirements for delivery of material samples, attic stock, and spare parts.
    - h. Requirements for demonstration and training.
    - i. Preparation of Contractor's punch list.
    - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - k. Submittal procedures.
    - l. Coordination of separate contracts.
    - m. Owner's partial occupancy requirements.
    - n. Installation of Owner's furniture, fixtures, and equipment.
    - o. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- F. Progress Meetings: Conduct progress meetings at regular intervals as defined and agreed to with Owner, Architect, Construction Manager and Contractor. (assumed bi-weekly)
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner, Construction Manager, 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.
    - 1) Review schedule for next period.
  - b. Review present and future needs of each entity present, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Resolution of component conflicts.
    - 4) Status of submittals.
    - 5) Status of sustainable design documentation.
    - 6) Deliveries.
    - 7) Off-site fabrication.
    - 8) Access.
    - 9) Site use.
    - 10) Temporary facilities and controls.
    - 11) Progress cleaning.
    - 12) Quality and work standards.
    - 13) Status of correction of deficient items.
    - 14) Field observations.
    - 15) Status of RFIs.
    - 16) Status of Proposal Requests.
    - 17) Pending changes.
    - 18) Status of Change Orders.
    - 19) Pending claims and disputes.
    - 20) Documentation of information for payment requests.
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.
- G. Contractor Coordination Meetings: Conduct Project coordination meetings at regular intervals (assumed weekly). Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of the General Contractor 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
  - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
  - c. Review present and future needs of each contractor present, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Resolution of component conflicts.
    - 4) Status of submittals.
    - 5) Deliveries.
    - 6) Off-site fabrication.
    - 7) Access.
    - 8) Site use.
    - 9) Temporary facilities and controls.
    - 10) Work hours.
    - 11) Hazards and risks.
    - 12) Progress cleaning.
    - 13) Quality and work standards.
    - 14) Status of RFIs.
    - 15) Proposal Requests.
    - 16) Change Orders.
    - 17) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013100**



## **SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION**

### **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 the following:
  - 1. Preconstruction photographs.
  - 2. Concealed Work photographs.
  - 3. Periodic construction photographs.
  - 4. Final Completion construction photographs.
  - 5. Preconstruction video recordings.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
  - 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description in web-based Project management software site:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date photograph was taken.

- f. Description of location, vantage point, and direction.
- g. Unique sequential identifier keyed to accompanying key plan.

#### **1.4 QUALITY ASSURANCE**

- A. **Photographer Qualifications:** An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

#### **1.5 FORMATS AND MEDIA**

- A. **Digital Photographs:** Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. **Digital Video Recordings:** Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. **Digital Images:** Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. **Metadata:** Record accurate date and time from camera.
- E. **File Names:** Name media files with date Project area and sequential numbering suffix.

#### **1.6 CONSTRUCTION PHOTOGRAPHS**

- A. **Photographer:** Engage a qualified photographer to take construction photographs.
- B. **General:** Take photographs with maximum depth of field and in focus.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. **Preconstruction Photographs:** Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect Construction Manager.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.

4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
1. Underground utilities.
  2. Underslab services.
  3. Piping.
  4. Electrical conduit.
  5. Waterproofing and weather-resistant barriers.
  6. Roofing Work.
- E. Periodic Construction Photographs: Take 20 photographs monthly. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013233**

## **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:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### **1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager'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 and Construction Manager'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."

#### **1.4 SUBMITTAL SCHEDULE**

- A. Submittal Schedule: Submit, as an action submittal, a list 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 Construction Manager 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 Schedule: 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 Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule as required 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 and Construction Manager's final release or approval.
    - g. Scheduled dates for purchasing.
    - h. Scheduled date of fabrication.
    - i. Scheduled dates for installation.

#### **1.5 SUBMITTAL FORMATS**

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
  2. Date.
  3. Name of Architect.
  4. Name of Construction Manager.
  5. Name of Contractor.
  6. Name of firm or entity that prepared submittal.

7. Names of subcontractor, manufacturer, and supplier.
  8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
  9. Category and type of submittal.
  10. Submittal purpose and description.
  11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  12. Drawing number and detail references, as appropriate.
  13. Indication of full or partial submittal.
  14. Location(s) where product is to be installed, as appropriate.
  15. Other necessary identification.
  16. Remarks.
  17. Signature of transmitter.
- B. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- C. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- D. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

## **1.6 SUBMITTAL PROCEDURES**

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- 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.
  4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- 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. 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 and Construction Manager's action stamp.
- E. 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.
- F. 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 and Construction Manager's action stamp.

## **1.7 SUBMITTAL REQUIREMENTS**

- A. 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 unsuitable 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.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.

- e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
  1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
  1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.



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.
  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, through Construction Manager, will return submittal with options selected.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
  2. 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.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. 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.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. 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.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

**1.8 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

#### **1.9 CONTRACTOR'S REVIEW**

- A. Action Submittals 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 and Construction Manager.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include 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.
  1. Architect and Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

#### **1.10 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW**

- A. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required[, and return].
  1. PDF Submittals: Architect and Construction Manager will indicate, via markup on each submittal, the appropriate action.
  2. Submittals by Web-Based Project Management Software: Architect and Construction Manager will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- D. Architect and Construction Manager will return without review submittals received from sources other than Contractor.
- E. Submittals not required by the Contract Documents will be returned by Architect without action.

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**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013300**

## **SECTION 013516 - ALTERATION PROJECT PROCEDURES**

### **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 special procedures for alteration work.

#### **1.3 DEFINITIONS**

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's pre-bid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

- K. Retain: To keep existing items that are not to be removed or dismantled.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

#### **1.4 COORDINATION**

- A. Alteration Work Sub-schedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
  - 1. Schedule construction operations in sequence required to obtain best Work results.
  - 2. Coordinate sequence of alteration work activities to accommodate the following:
    - a. Owner's continuing occupancy of portions of existing building.
    - b. Other known work in progress.
    - c. Tests and inspections.
  - 3. Detail sequence of alteration work, with start and end dates.
  - 4. Utility Services: Avoid utility service interruptions. Coordinate shutoff, capping, and continuation of utility services.
  - 5. Use of elevator and stairs.
  - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and adjacent to restricted areas. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the Work accordingly.

#### **1.5 PROJECT MEETINGS FOR ALTERATION WORK**

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
  - 1. Attendees: In addition to representatives of Owner, Construction Manager, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
  - 2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
    - a. Alteration Work Sub-schedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.

- b. Fire-prevention plan.
  - c. Governing regulations.
  - d. Areas where existing construction is to remain and the required protection.
  - e. Hauling routes.
  - f. Sequence of alteration work operations.
  - g. Storage, protection, and accounting for salvaged and specially fabricated items.
  - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
  - i. Qualifications of personnel assigned to alteration work and assigned duties.
  - j. Requirements for extent and quality of work, tolerances, and required clearances.
  - k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Contractor Coordination Meetings: Conduct coordination meetings specifically for alteration work at regular intervals (assumed weekly). Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of the Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work. Construction Manager may attend meeting upon request.
  2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
    - a. Alteration Work Sub-schedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
    - b. Schedule Updating: Revise Contractor's Alteration Work Sub-schedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
      - 1) Interface requirements of alteration work with other Project Work.
      - 2) Status of submittals for alteration work.
      - 3) Access to alteration work locations.
      - 4) Effectiveness of fire-prevention plan.
      - 5) Quality and work standards of alteration work.

- 6) Change Orders for alteration work.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

## **1.6 MATERIALS OWNERSHIP**

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
  1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

## **1.7 INFORMATIONAL SUBMITTALS**

- A. Alteration Work Sub-schedule:
  1. Submit alteration work sub-schedule within seven days of date established for commencement of alteration work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

## **1.8 QUALITY ASSURANCE**

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
  1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
- B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.



1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
  2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- D. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

## **1.9 STORAGE AND HANDLING OF SALVAGED MATERIALS**

### **A. Salvaged Materials:**

1. Existing materials to be salvaged as identified by the Owner:
  - a. Items noted on the drawings or identified by the Owner in the field.
  - b. All existing hinged doors and hardware to be removed.
2. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
3. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
4. Store items in a secure area until delivery to Owner.
5. Transport items to Owner's storage area designated by Owner.
6. Protect items from damage during transport and storage.

### **B. Salvaged Materials for Reinstallation:**

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

### **C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.**

### **D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.**

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

E. Storage Space:

1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space includes security for stored material.
2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

**1.10 FIELD CONDITIONS**

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs and preconstruction videotapes.
  1. Comply with requirements specified in Section 013233 "Photographic Documentation."
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
  1. Furniture and loose equipment.
- D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

**PART 2 - PRODUCTS - (Not Used)**

**PART 3 - EXECUTION**

**3.1 PROTECTION**

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
  1. Use only proven protection methods, appropriate to each area and surface being protected.

2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
  3. Erect temporary barriers to form and maintain fire-egress routes.
  4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
  5. Contain dust and debris generated by alteration work and prevent it from reaching the public or adjacent surfaces.
  6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
  7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
  8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
  2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
  3. Maintain existing services unless otherwise indicated; keep in service and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
  2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection to maintaining integrity of roofing systems. Maintain existing roof warranty in place. Work must be performed by a certified installer to maintain the system warranty.

### **3.2 PROTECTION FROM FIRE**

- A. General: Follow fire-prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated.
  2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
  2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
  3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
  5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    - e. Maintain fire-watch personnel at each area of Project site until two hours after conclusion of daily work.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
  - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

### **3.3 PROTECTION DURING APPLICATION OF CHEMICALS**

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### **3.4 GENERAL ALTERATION WORK**

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
  - 1. Do not proceed with the work in question until directed by Architect.

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**END OF SECTION 013516**

## **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 inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

#### **1.3 DEFINITIONS**

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

- D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work if accepted and approved in writing in advance by the Architect / Engineer.
    - a. Include each system, assembly, component, and part of the exterior wall and roof to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.
  2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction if accepted and approved in writing in advance by the Architect / Engineer.
- E. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- I. 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.



- J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect[ **or Construction Manager**].

#### **1.4 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### **1.5 CONFLICTING REQUIREMENTS**

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification 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.

#### **1.6 ACTION SUBMITTALS**

- A. Mockup Shop Drawings: For mockups.
  - 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
  - 2. Indicate manufacturer and model number of individual components.
  - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

## **1.7 INFORMATIONAL SUBMITTALS**

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. 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.
- E. 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.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, 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 CONTRACTOR'S QUALITY-CONTROL PLAN**

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, 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 and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

- B. **Quality-Control Personnel Qualifications:** Engage qualified 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.
  - 2. The individual must have successfully completed a minimum of (5) five projects within the past (5) five years as the project quality control manager and as the project superintendent. Provide resume of the individual and project references including client contact information (client name, individual contact, address, phone number, email address).
- 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. Distinguish source quality-control tests and inspections from field quality-control 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, including tests and inspections indicated to be performed by Commissioning Authority as required by the Owner / contract.
- 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 the 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.

## **1.9 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, telephone number, and email address 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 inspection.
  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 reinspecting.
- 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, telephone number, and email address 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 of 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, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

## **1.10 QUALITY ASSURANCE**

- A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- 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, applying, 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 is similar in material, design, and extent to those indicated for this Project.
- F. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- 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, demonstrate, repair, and perform service on installations 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 Contractor's responsibilities, including the following:
  - 1. Provide test specimens representative of proposed products and construction.
  - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
  - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.

6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, 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.
  
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  1. Build mockups of size indicated.
  2. Build mockups in location indicated or, if not indicated, as directed by Architect.
  3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
  4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
  5. Demonstrate the proposed range of aesthetic effects and workmanship.
  6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
    - a. Allow fourteen days for initial review and each re-review of each mockup.
  7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
  8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  10. Demolish and remove mockups when directed unless otherwise indicated.
  
- K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.
  1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.

## **1.11 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.
  1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

2. Payment for these services will be made by the Owner.
  3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
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. Engage a qualified testing agency to perform 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 inspection 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 inspection 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. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations 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 duties of Contractor.

- E. **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."
- F. **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 preinstallation 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.
- G. **Contractor's Associated Requirements and Services:** Cooperate with agencies and representatives 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 inspection. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
  - 1. **Schedule Contents:** Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  - 2. **Distribution:** Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.



## **1.12 SPECIAL TESTS AND INSPECTIONS**

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect, Commissioning Authority, , Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected Work.

## **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. Deficiency log which includes a log of deficiencies, corrective actions taken, retesting, and reinspecting corrected Work.
  4. Date test or inspection results were transmitted to Architect.
  5. 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, Commissioning Authority's, and Construction Manager's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

### **3.2 REPAIR AND PROTECTION**

- A. General: On completion of testing, inspection, 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 Section 017300 "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 014200 - REFERENCES**

### **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 DEFINITIONS**

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

### **1.3 INDUSTRY STANDARDS**

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
  - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

### **1.4 ABBREVIATIONS AND ACRONYMS**

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
  - 1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  - 2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
  - 3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  - 4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  - 5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  - 6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  - 7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  - 8. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
  - 9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  - 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  - 11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  - 12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  - 13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  - 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  - 15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  - 16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  - 17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).

18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
34. ASSP - American Society of Safety Professionals (The); [www.assp.org](http://www.assp.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); [www.soundandcommunications.com](http://www.soundandcommunications.com).
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
39. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
40. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
41. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
42. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
43. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
44. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
46. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
48. CE - Conformance Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
49. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
50. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
51. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
52. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
53. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
54. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
55. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
56. CPA - Composite Panel Association; [www.compositepanel.org](http://www.compositepanel.org).
57. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
58. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).

59. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
60. CSA - CSA Group; [www.csa-group.org](http://www.csa-group.org).
61. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
62. CTA - Consumer Technology Association; [www.cta.tech](http://www.cta.tech).
63. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.coolingtechnology.org](http://www.coolingtechnology.org).
64. CWC - Composite Wood Council; (See CPA).
65. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
66. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); [www.decorativehardwoods.org](http://www.decorativehardwoods.org).
67. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
68. ECA - Electronic Components Association; (See ECIA).
69. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
70. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
71. EIA - Electronic Industries Alliance; (See TIA).
72. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
73. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
74. ESTA - Entertainment Services and Technology Association; (See PLASA).
75. ETL - Intertek (See Intertek); [www.intertek.com](http://www.intertek.com).
76. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
77. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
78. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
79. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
80. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
81. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
82. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
83. GANA - Glass Association of North America; (See NGA).
84. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
85. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
86. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
87. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
88. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
89. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
90. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
91. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
92. ICBO - International Conference of Building Officials; (See ICC).
93. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
94. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
95. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
96. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
97. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
98. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
99. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
100. IESNA - Illuminating Engineering Society of North America; (See IES).
101. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
102. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).

103. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
104. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
105. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
106. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
107. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
108. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
109. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
110. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
111. LMA - Laminating Materials Association; (See CPA).
112. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
113. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
114. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
115. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
116. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
117. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
118. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
119. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
120. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
121. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
122. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
123. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
124. NALP - National Association of Landscape Professionals; [www.landscapeprofessionals.org](http://www.landscapeprofessionals.org).
125. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
126. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
127. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
128. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
129. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
130. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
131. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
132. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
133. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
134. NFPA - NFPA International; (See NFPA).
135. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
136. NGA - National Glass Association (The); (Formerly: Glass Association of North America); [www.glass.org](http://www.glass.org).
137. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
138. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
139. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
140. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
141. NSI - National Stone Institute; (Formerly: Marble Institute of America); [www.naturalstoneinstitute.org](http://www.naturalstoneinstitute.org).
142. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).

143. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
144. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
145. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
146. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
147. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
148. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
149. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
150. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
151. SAE - SAE International; [www.sae.org](http://www.sae.org).
152. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
153. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
154. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
155. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
156. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
157. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
158. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
159. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
160. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
161. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
162. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
163. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
164. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
165. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
166. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
167. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
168. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
169. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
170. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
171. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
172. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
173. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
174. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
175. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
176. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
177. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
178. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
179. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
180. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
181. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
182. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
183. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).



www.wwpa.org Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  2. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  2. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  3. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  4. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  5. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  6. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  7. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.govinfo.gov](http://www.govinfo.gov).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
  2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
  3. CDHS; California Department of Health Services; (See CDPH).
  4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
  5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
  6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
  7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestservicetamu.edu](http://www.txforestservicetamu.edu).

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 014200**

## **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.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 012100 "Allowances" for allowance for metered use of temporary utilities.

#### **1.3 USE CHARGES**

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### **1.4 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. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
  - 3. Indicate methods to be used to avoid trapping water in finished work.
- G. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
  - 1. Locations of dust-control partitions at each phase of work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air-filtration system discharge.
  - 4. Waste-handling procedures.
  - 5. Other dust-control measures.
- H. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
  - 1. Methods used to meet the goals and requirements of the Owner.
  - 2. Concrete cutting method(s) to be used.
  - 3. Location of construction devices on the site.
  - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
  - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
  - 6. Indicate locations of sensitive equipment or occupancy areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

## **1.5 QUALITY ASSURANCE**

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

## **1.6 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. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- E. 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. Common-Use Field Office: Upon Owner approval utilize space designated within the existing building 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 designated area clean and orderly.

- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

### **2.3 EQUIPMENT**

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 min at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

## **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.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

### **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.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- 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 services 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.
  - 2. The existing 911 dispatch area must remain in operation 24/7 until Phase 1 is fully operational. It is the General Contractors responsibility to provide any; and all coordination and cost for temporary power and services required to fulfill this requirement.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- F. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
  - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
  3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead unless otherwise indicated.
  2. Connect temporary service to Owner's existing power source, as directed by Owner.
- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for designated field office. Upon Owners approval, utilize space within the existing building for construction office.
1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Construction Manager's home office.
    - g. Engineers' offices.
    - h. Owner's office.
    - i. Principal subcontractors' field and home offices.
- L. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

### **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. Utilize designated area within existing building for temporary field offices.
  3. 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. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.
  4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel as approved by Owner.
- F. Storage and Staging: Provide temporary offsite area or Use designated areas of Project site for storage and staging needs as approved by Owner.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings as directed by Owner.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
  - a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs, so they are legible at all times.
- I. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- J. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- K. 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.
- L. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
  1. Do not load elevators beyond their rated weight capacity.
  2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- M. 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.
- N. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### **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. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
  1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
  2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the Project duration.
  4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
  1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. 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.

- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
  - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - 2. Paint and maintain appearance of walkway for duration of the Work.
- L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
  - 1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
    - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
  - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
  - 4. Insulate partitions to control noise transmission to occupied areas.
  - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
  - 6. Protect air-handling equipment.
  - 7. Provide walk-off mats at each entrance through temporary partition.
- N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### **3.6 MOISTURE AND MOLD CONTROL**

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard and replace stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

- a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 72 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 72 hours.

### **3.7 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.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

**END OF SECTION 015000**

## **SECTION 016000 - PRODUCT 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 selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
  - 2. Section 012100 "Allowances" for products selected under an allowance.
  - 3. Section 012500 "Substitution Procedures" for requests for substitutions.
  - 4. Section 014200 "References" for applicable industry standards for products specified.
  - 5. Section 01770 "Closeout Procedures" for submitting warranties.

#### **1.3 DEFINITIONS**

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
  - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- B. **Basis-of-Design Product Specification:** A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
  - 1. **Evaluation of Comparable Products:** In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. **Subject to Compliance with Requirements:** Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. **Comparable Product Request Submittal:** An action submittal requesting consideration of a comparable product, including the following information:
  - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. **Basis-of-Design Product Specification Submittal:** An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. **Substitution:** Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

#### **1.4 QUALITY ASSURANCE**

- A. **Compatibility of Options:** If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. **Resolution of Compatibility Disputes between Multiple Contractors:**
    - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.



- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

## **1.5 COORDINATION**

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

## **1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## **1.7 PRODUCT WARRANTIES**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
  2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

## **PART 2 - PRODUCTS**

### **2.1 PRODUCT SELECTION PROCEDURES**

- A. **General Product Requirements:** Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
  - a. Submit additional documentation required by Architect through Construction Manager in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

## **2.2 COMPARABLE PRODUCTS**

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
  2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 016000**

## **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. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for coordination of Owner-furnished products, and limits on use of Project site.
  - 2. Section 013100 "Project Management and Coordination" for Background check requirements for all contractors.
  - 3. Section 013300 "Submittal Procedures" for submitting surveys.
  - 4. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
  - 5. Division 02 "Selective Demolition" for demolition and removal of selected portions of the building.
  - 6. Division 07 "Firestopping Systems" for patching penetrations in fire-rated construction.

#### **1.3 DEFINITIONS**

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### **1.4 PREINSTALLATION MEETINGS**

- A. Cutting and Patching Conference: Conduct conference at Project site.
  - 1. Prior to submitting cutting and patching plan, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
    - a. Contractor's superintendent.
    - b. Trade supervisor responsible for cutting operations.
    - c. Trade supervisor(s) responsible for patching of each type of substrate.
    - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
  - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site.
  - 1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
    - a. Contractor's superintendent.
    - b. Contractor's personnel responsible for performing Project surveying and layout.
    - c. Professional surveyor responsible for performing site survey serving as basis for Project design.
  - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
  - 3. Review requirements for including layouts on Shop Drawings and other submittals.
  - 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For land surveyor.
- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.

- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 min days prior to the time cutting and patching will be performed. Include the following information:
1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  3. Products: List products to be used for patching and firms or entities that will perform patching work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
    - b. Provide temporary services to maintain system operations while permanent service is out of service.
    - c. Temporary services must be in place and fully operational before existing service is interrupted and taken out of service.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Final Property Survey: Submit four copies showing the Work performed and record survey data plus one PDF copy.

## **1.7 QUALITY ASSURANCE**

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:
  - a. Primary operational systems and equipment.
  - b. Fire separation assemblies.
  - c. Air or smoke barriers.
  - d. Fire-suppression systems.
  - e. Plumbing piping systems.
  - f. Mechanical systems piping and ducts.
  - g. Control systems.
  - h. Communication systems.
  - i. Fire-detection and -alarm systems.
  - j. Electrical wiring systems.
  - k. Operating systems of special construction.
3. 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. Other construction elements include but are not limited to the following:
  - a. Water, moisture, or vapor barriers.
  - b. Membranes and flashings.
  - c. Exterior curtain-wall construction.
  - d. Sprayed fire-resistive material.
  - e. Equipment supports.
  - f. Piping, ductwork, vessels, and equipment.
  - g. Noise- and vibration-control elements and systems.
4. 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.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Comply with requirements specified in other Sections.



1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. 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 Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. 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.
  1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the Code of Regulations maximum allowable VOC levels.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  2. List of detrimental conditions, including substrates.
  3. List of unacceptable installation tolerances.
  4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### **3.2 PREPARATION**

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

### **3.3 CONSTRUCTION LAYOUT**

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
  1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.

7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### **3.4 FIELD ENGINEERING**

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### **3.5 INSTALLATION**

- A. 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, unless otherwise indicated on Drawings.
- 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 satisfactory results as judged by Architect. 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 of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. 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 with manufacturer.
  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.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
  1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

### **3.6 CUTTING AND PATCHING**

- A. 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. 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.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. 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.
- E. 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 in Section 011000 "Summary."
- F. 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 prevent interruption to occupied areas.
- G. 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. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. 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.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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, as judged by Architect. 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 eliminate 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. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### **3.7 COORDINATION OF OWNER'S PORTION OF THE WORK**

- A. Site Access: Provide access to Project site for Owner's construction personnel .
  - 1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
  - 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products.
  
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel .
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### **3.8 PROGRESS CLEANING**

- A. 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. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
  
- 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:** 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. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- 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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### **3.9 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 Section 014000 "Quality Requirements."

### **3.10 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

**END OF SECTION 017300**

## **SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **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 the following:
  - 1. Salvaging nonhazardous demolition and construction waste.
  - 2. Recycling nonhazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
  - 1. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.

#### **1.3 DEFINITIONS**

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### **1.4 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition and construction waste become 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 INFORMATIONAL SUBMITTALS**

- A. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- B. Refrigerant Recovery: Comply with requirements in Section 0241 for refrigerant recovery submittals.

#### **1.6 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
  - 1. Review and discuss waste management plan including responsibilities of each contractor.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.
  - 6. Discuss dumpster locations and staging.
  - 7. Discuss removal coordination and locations of waste bins to avoid interference with Owners operation and occupancy requirements.

#### **1.7 WASTE MANAGEMENT PLAN**

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification and a waste work plan including definition of dumpster location by phase, staging areas, and removal cycle. Distinguish between demolition and construction waste.

- B. Waste Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project.
  2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  4. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
1. Demolition Waste:
    - a. Asphalt paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Brick.
    - e. Concrete masonry units.
    - f. Wood studs.
    - g. Wood joists.
    - h. Plywood and oriented strand board.
    - i. Wood paneling.
    - j. Wood trim.
    - k. Structural and miscellaneous steel.
    - l. Rough hardware.
    - m. Roofing.
    - n. Insulation.
    - o. Doors and frames.
    - p. Door hardware.
    - q. Windows.
    - r. Glazing.
    - s. Metal studs.
    - t. Gypsum board.
    - u. Acoustical tile and panels.
    - v. Carpet.
    - w. Carpet pad.
    - x. Demountable partitions.

- y. Equipment.
  - z. Cabinets.
  - aa. Plumbing fixtures.
  - bb. Piping.
  - cc. Supports and hangers.
  - dd. Valves.
  - ee. Sprinklers.
  - ff. Mechanical equipment.
  - gg. Refrigerants.
  - hh. Electrical conduit.
  - ii. Copper wiring.
  - jj. Lighting fixtures.
  - kk. Lamps.
  - ll. Ballasts.
  - mm. Electrical devices.
  - nn. Switchgear and panelboards.
  - oo. Transformers.
2. Construction Waste:
- a. Masonry and CMU.
  - b. Lumber.
  - c. Wood sheet materials.
  - d. Wood trim.
  - e. Metals.
  - f. Roofing.
  - g. Insulation.
  - h. Carpet and pad.
  - i. Gypsum board.
  - j. Piping.
  - k. Electrical conduit.
  - l. Packaging: Goal is to salvage or recycle 100 percent of the following uncontaminated packaging materials:
    - 1) Paper.
    - 2) Cardboard.
    - 3) Boxes.
    - 4) Plastic sheet and film.
    - 5) Polystyrene packaging.
    - 6) Wood crates.
    - 7) Wood pallets.
    - 8) Plastic pails.
  - m. Construction Office Waste: Goal is to salvage or recycle 100 percent of the following construction office waste materials:
    - 1) Paper.
    - 2) Aluminum cans.

- 3) Glass containers.

## **PART 3 - EXECUTION**

### **3.1 PLAN IMPLEMENTATION**

- A. General: Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
  2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### **3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL**

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to construction waste management plan.
  1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

### **3.3 RECYCLING DEMOLITION WASTE**

- A. Sort demolition waste by material type as noted.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
- D. Wood Materials: Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
- F. Gypsum Board: Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- G. Acoustical Ceiling Panels and Tile.
- H. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips as required by carpet reclamation agency or carpet recycler.
- J. Carpet Tile: Remove debris, trash, and adhesive by carpet reclamation agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- L. Conduit: Reduce conduit to straight lengths by material and size.
- M. Lamps: Separate lamps by type according to requirements in 40 CFR 273.

### **3.4 RECYCLING CONSTRUCTION WASTE**

- A. Packaging:
  1. Cardboard and Boxes: Break down packaging into flat sheets.
  2. Polystyrene Packaging: Separate.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
1. Clean Cut-Offs of Lumber: Sort and separate with wood products.
  2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack in container.
- D. Paint: Seal containers and store by type.

### **3.5 DISPOSAL OF WASTE**

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of legally.
- C. Burning: Do not burn waste materials.

**END OF SECTION 017419**



## **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.
- B. Related Requirements:
  - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
  - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
  - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 5. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### **1.3 DEFINITIONS**

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

- C. Certified List of Incomplete Items: Final submittal at Final Completion.

### **1.5 CLOSEOUT SUBMITTALS**

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

### **1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

### **1.7 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.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect Construction Manager. Label with manufacturer's name and model number.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's Construction Manager's Owner's signature for receipt of submittals.
  - 5. Submit testing, adjusting, and balancing records.
  - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

## **1.8 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 in accordance with Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
  5. Submit Final Completion photographic documentation.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect[ and Construction Manager] will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

### **1.9 LIST OF INCOMPLETE ITEMS**

- 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 items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  2. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Page number.
  3. Submit list of incomplete items in the following format:
    - a. PDF Electronic File: Architect, through Construction Manager, will return annotated file.

### **1.10 SUBMITTAL OF PROJECT WARRANTIES**

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  - 1. Submit by uploading to web-based project software site.
- E. Warranties in Paper Form:
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. 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.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the Code of Regulations maximum allowable VOC levels.

## **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 of rubbish, waste material, litter, and other foreign substances.
  - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and 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.
  - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
  - i. Vacuum and mop concrete.
  - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
  - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - l. Remove labels that are not permanent.
  - m. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - p. Clean ducts, blowers, and coils.
  - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - r. Clean strainers.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."

### **3.2 REPAIR OF THE WORK**

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**END OF SECTION 017700**

## **SECTION 017823 - OPERATION AND MAINTENANCE DATA**

### **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 preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### **1.3 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.



- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. For Review - Submit on digital media acceptable to Architect by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  - 2. Final Submission to Owner - Submit three paper copies. Architect, through Construction Manager, will return three copies for Owner use.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## **1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS**

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required. Upon approval of final manuals by Architect, CM and Owner, all manuals shall be delivered in paper format in binders and electronic format (PDF) on a thumb-drive including all documents and drawings.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size in PDF format. Submit on thumb-drive.
  - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Final Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
  - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## **1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## **1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

## **1.8 EMERGENCY MANUALS**

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.

2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## **1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS**

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

#### **1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS**

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of maintenance manuals.

#### **1.11 PRODUCT MAINTENANCE MANUALS**

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 017823**



## **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.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints (hard copy – full size drawings). Deliver on thumb-drive catalogued by drawing number and title.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:

- 1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints. Deliver on thumb-drive catalogued by drawing number and title.
  - 2) Print each drawing, whether or not changes and additional information were recorded (hard copy – full size drawings).
- B. Record Specifications: Submit hard copy and annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications. Deliver PDF's on thumb-drive catalogued by specification number and title.
- C. Record Product Data: Submit hard copy and annotated PDF electronic files and directories of each submittal. Deliver PDF's on thumb-drive.
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.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

#### **1.4 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 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. Depths of foundations.
    - d. Locations and depths of underground utilities.

- e. Revisions to routing of piping and conduits.
  - f. Revisions to electrical circuitry.
  - g. Actual equipment locations.
  - h. Duct size and routing.
  - i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or Construction Change Directive.
  - k. Changes made following Architect's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
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 prints 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. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
    - a. Format: DWG, Version, Acceptable to Architect and Owner using a Microsoft Windows operating system; or
    - b. Format: Annotated PDF electronic file with comment function enabled.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect through Construction Manager for resolution.
  4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:

- a. Project name.
- b. Date.
- c. Designation "PROJECT RECORD DRAWINGS."
- d. Name of Architect and Construction Manager.
- e. Name of Contractor.

## **1.5 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. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

## **1.6 RECORD PRODUCT DATA**

- 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. 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, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
  1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

**1.7 MISCELLANEOUS RECORD SUBMITTALS**

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

**1.8 MAINTENANCE OF RECORD DOCUMENTS**

- A. Maintenance of Record Documents: Store Record Documents 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 and Construction Manager's reference during normal working hours.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 017839**

## **SECTION 017900 - DEMONSTRATION AND TRAINING**

### **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 instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.

- b. Name and address of videographer.
  - c. Name of Architect.
  - d. Name of Construction Manager.
  - e. Name of Contractor.
  - f. Date of video recording.
2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
  3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

## **1.5 QUALITY ASSURANCE**

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## **1.6 COORDINATION**

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

## **1.7 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
  
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. Maintenance service agreements and similar continuing commitments.
  
  - 3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  
  - 4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.



- f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## **1.8 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

**1.9 INSTRUCTION**

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Instructor to describe system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish a representative to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**PART 2 - PRODUCTS**

**PART 3 - EXECUTION**

**END OF SECTION 017900**



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## **SECTION 024100 – SELECTIVE DEMOLITION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes, but is not limited to, the following:
  - 1. Selective Demolition Work: Includes work on site and off site, as indicated on contract drawings. Work includes, but is not limited to, the following, roof system, roof copings, Mechanical equipment service line removal, temporary connections and reinstallation.
  - 2. Selective demolition of building elements for alteration purposes.
  - 3. Abandonment and removal of existing utilities and utility structures.
  - 4. Selective removal and subsequent off-site disposal of components within existing structure indicated on Drawings to remain, including (but not limited to) the following:
    - a. Removal of doors and frames indicated on Drawings for removal.
    - b. Removal and protection of existing fixtures, materials, and equipment items indicated to be turned over to Owner.
    - c. Roofing and roof insulation removal as indicated on Drawings.
    - d. Cutting non-structural concrete floors and masonry walls for piping, ducts, and conduits as indicated on Drawings.
    - e. Cutting holes in roof deck for installation of new mechanical equipment as indicated on Drawings.
- B. Related Sections
  - 1. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
  - 2. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; current edition.
  - 3. DIVISION 01 –
    - a. Alteration Project Procedures: Asbestos and asbestos-containing materials encountered during demolition.
    - b. Temporary Construction: Site fences, security, protective barriers, and waste removal.
    - c. Cutting and Patching.
    - d. Construction Waste Management and Disposal.

#### **1.2 DEFINITIONS**

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove Items indicated; clean, service, and otherwise prepare for reuse; store and protect against damage. Reinstall items in same locations or in locations indicated or noted.

- D. Existing to Remain: Protect construction indicated to remain against damage and moisture during selective demolition. When permitted by Owner's Representative and Architect, items may be removed to suitable, storage location during selective demolition and then cleaned and reinstalled in original locations.

### **1.3 SUBMITTALS**

- A. Comply with requirements of DIVISION 01 - Submittals and as modified below.
- B. Site Plan: Showing:
  - 1. To be determined in the field with the owner, construction manager and contractor.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
  - 2. Identify demolition firm and submit qualifications.
  - 3. Include a summary of safety procedures.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities
- E. and subsurface construction.
- F. Proposed Schedule: Submit schedule indicating proposed sequence of operations for demolition to Owners Representative and Architect for review prior to start of Work. Contractor to coordinate and indicate activities in proposed Bar Graph Schedule. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
  - 1. Provide detailed sequence of demolition and removals to ensure uninterrupted progress of Owner's on-site operations, including starting and ending dates for each activity.
  - 2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed new addition.
  - 3. Include details for use of stairs and locations of temporary partitions and means of egress.
- G. Inventories: Submit detailed inventories of items to be removed and salvaged and items to be removed by Owner.
- H. Photograph or Videotape: Obtain photographic or videotape recordings of existing conditions of entire project site / work area, including but not limited to the following, site walkways, concrete curb and gutters, Public Right Of Ways, existing parking lots to remain, existing structures and areas to remain, structure surfaces and equipment to remain and adjacent structures and site improvements that might be misconstrued as damage related to removal operations. Submit photographs or videotapes to Owner's Representative prior to start of Work as a submittal package approved by Architect. Provide copies photographs and videotapes on USB stick for review. Catalogue information so it is identifiable and use a table of contents format.
- I. Quality Control Submittals:
  - 1. Landfill Records: Submit landfill records indicating receipt and acceptance of hazardous wastes by landfill facility licensed to accept hazardous wastes.

### **1.4 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: Engage experienced firm that has successfully completed selective demolition similar to that indicated for this Project with a minimum of ten (10) years of successful documented experience. Submit a listing of five (5) buildings of similar size and complexity complete with Names, address and telephone numbers of Owner and Architects.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-Demolition Conference: Prior to beginning demolition, conduct conference at Site to review requirements and conditions for selective demolition with attendance by at least the following:
  - 1. Contractor's Representative.
  - 2. Selective Demolition Subcontractor Representative, if applicable.
  - 3. All Sub-Contractors requiring cutting services of Contractor.
  - 4. Owner's Representative.
  - 5. Architect's Representative (if scheduled with regularly scheduled job meeting).

## **1.5 PROJECT / SITE CONDITIONS**

- A. Inspection
  - 1. Prior to commencement of the selective removals and demolition Work, inspect the areas in which the Work will be performed. Determine and list the existing conditions of rooms or area surfaces and equipment. After the Work in each respective area is completed, determine if adjacent surfaces or equipment have been damaged as a result of the Work; if so, the damage shall be corrected at the Contractor's expense.
  - 2. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.
  - 3. Survey 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 selective demolition. Report any structural concerns directly to the Architect.
  - 4. Perform additional surveys as selective demolition progresses to detect hazards resulting from selective demolition activities
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 6. Do not close or obstruct roadways or sidewalks without permit.

7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  
- C. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- D. Do not begin removal until receipt of notification to proceed from Owner.
- E. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of demolition. Conduct demolition operations in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations. Any system shut down must be coordinated and approved by Owner in advance, as noted above.
- F. Condition of Structure: Owner assumes no responsibility for actual condition of items or structures to be demolished.
  1. Owner shall maintain conditions existing at time of inspection for bidding purposes as far as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of demolition.
  2. Items to be Removed by Owner: The following items that may be present in the building at time of Contractor's inspection prior to Bidding will be removed and retained by Owner prior to start of demolition:
    - a. Stored Materials
    - b. Loose furniture and equipment
    - c. Metal Lockers where applicable
    - d. Storage shelving and stored items
    - e. Electronic equipment
- G. Explosives: Do not bring explosives to Site or use explosives without written consent of Owner, Architect, and authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. Perform required blasting in compliance with governing regulations.
- H. Damages: Promptly repair damages caused to adjacent facilities by demolition.
- I. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
  1. Maintain adequate ventilation when using cutting torches.
    - a. Maintain sheet type protection, around cutting area including below it, when using cutting torches and provide fire extinguishers within reach of torch area as required by local code requirements.
- J. Utility Services: Maintain existing utilities to remain in service and protect them against damage during demolition operations.
  1. Do not interrupt utilities servicing occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
  2. Protect existing utilities to remain from damage.
  3. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

4. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
5. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
6. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
7. Maintain fire protection services during demolition operations.
8. Owner will arrange for disconnecting and sealing utilities serving structures to be demolished, prior to start of demolition, upon written request of Contractor.

## **PART 2 - PRODUCTS NOT USED.**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions:
  1. Survey existing conditions and compare with requirements indicated to determine extent of selective demolition required.
  2. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.
  3. Survey 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 selective demolition. Report any structural concerns directly to the Architect.
- B. Perform additional surveys as selective demolition progresses to detect hazards resulting from selective demolition activities.

### **3.2 PREPARATION**

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  1. Do not close or obstruct streets, walks, corridors or other adjacent occupied or used facilities without permission from Owner, Architect, and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings, spaces, and facilities to remain. Ensure safe passage of people around selective demolition area and for required building egress.
  1. To be determined in the field with the owner, construction manager and contractor including the following:
    - a. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways whether shown, or not shown on drawings.
    - b. Protect existing site improvements, appurtenances, and landscaping to remain.

- c. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
  - d. Protect walls, ceilings, floors, and other existing finishes that are to remain and are exposed during selective demolition operations.
  - e. Cover and protect furniture, equipment, and fixtures from soilure or damage when demolition is performed in areas where such items have not been removed.
- C. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain. Refer to Division for additional requirements.
- 1. Shoring and Bracing: The Contractor shall retain the services of a Professional Engineer registered in the State where the work is taking place to provide design of all temporary bracing, shoring, etc. that may be required as part of selective demolition, removals, and salvage work.
  - 2. It shall be the responsibility of the Contractor to prepare detail drawings and associated calculations representing all shoring, bracing, or other temporary construction that may be required to maintain the structural stability and integrity of the existing construction during the course of the work.
  - 3. Cease operations and notify Architect and Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
  - 4. Coordinate with related provisions in Division 01 - Construction Facilities and Temporary Controls.
  - 5. Erect and maintain temporary dust-proof and sound retardant partitions and closures as required preventing spread of dust or fumes to occupied portions of the building for each area and Phase of work.
    - a. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4-inch metal studs, 1/2-inch drywall (joints taped) on occupied side, 5/8-inch fire-retardant treated plywood on demolition side. Fill partition cavity with sound-deadening insulation (Sound Retardant Batts) with a minimum STC rating of 48.
    - b. Provide temporary insulated weatherproof closures for exterior openings resulting from demolition. Do not leave any opening in exterior shell, including roof areas, open over night or when inclement weather is predicted for day or night.
    - c. Seal joints and perimeter. Equip partitions with dustproof doors and security locks. Protect air-handling equipment. Provide egress hardware where required by local code officer to maintain egress requirements.
  - 6. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
    - a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Architect and Owner if shutdown of service is necessary during changeover. Shutdowns may need to occur on hours after normal operations of the existing facility, based on Owners review and approval.

- D. Dust Control – Contractor: Minimize raising dust from construction operations and provide positive means to prevent air-borne dust from dispersing into atmosphere on the site and within the building footprint / rooms.
  - 1. Dust and debris control from roof demolition work by Contractor: Install plastic tarps inside the rooms that sit below the roof level work area to be demolished to protect existing items from falling debris and dust. Contractor to inspect areas before work begins to ensure protection is in place and after demolition work is completed. This will be a daily inspection at a minimum. All areas are to be cleaned of debris and dust daily by the contractor at a minimum before the close of the workday. All items are to be returned to their original condition. Final inspection approval by the Architect and Owner. Contractor will correct all items identified by the Architect / Owner to obtain final approval.
  - 2. Install interior dust partitions to prevent the migration of dust from the work area to occupied areas. Dust partitions to be located where agreed to with Architect and Owner and extend from wall to wall and floor to ceiling.
- E. Vermin Control: Employ a certified, licensed exterminator and treat entire area of building demolition and removal in accordance with governing health regulations for rodent and insect control.
- F. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.
  - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution or when governing regulations prohibit.
  - 2. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of Work.
  - 3. Provide enclosed air chamber at exit areas from demolition work area to occupied School areas at each project area and Phase of construction. Provide dirt walk-off mats in such areas to wipe feet on prior to exit from demolition work area to occupied School areas.

### **3.3 SELECTIVE DEMOLITION**

- A. Refer to DIVISION 01 - Cutting and Patching for requirements. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations. Complete selective demolition above each floor or tier before disturbing supporting members on lower levels.
  - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
    - a. Rough Openings in Roofs: Cutting of openings in existing or newly installed roofs, including all required structural framing and other accessories and construction, shall be provided by the Contractor, unless otherwise specified in Contract Documents.
      - 1) Each sub-contractor shall coordinate with the Contractor to ensure openings are provided in required locations with required dimensions.

2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
  4. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
    - a. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.
    - b. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
    - c. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over (6) inches in diameter, roots, or other organic matter.
  5. Cut or drill from exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove resilient floor coverings and adhesive according to recommendations of Resilient Floor Covering Institute's (RFCI) "Recommended Work Practices for the Removal of Resilient Floor Coverings" and Addendum.
    - a. Remove residual adhesive and prepare substrate for new floor coverings by method recommended by RFCI.
  8. Remove air-conditioning equipment only after removing refrigerants in accordance with the EPA requirements.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect and Owner's Representative in written, accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
- C. Salvaged Materials
1. Salvage of Materials for Reuse in Project: Remove carefully to avoid damages. Materials for reuse on this Project (if any) are to be incorporated into new work as indicated.
  2. Salvage of Materials by Contractor: Items of salvable value to Contractor that are not indicated by Owner for Owner's retention in accordance with provisions of Division 01 – Selective Demolition may be removed from structure as Work progresses. Transport salvaged items to be retained by Contractor from site as they are removed. Storage or sale of removed items will not be permitted on Site.



3. Salvaged Items to Be Retained by Owner: Carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.
  - a. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of Owner. Notify Architect and Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage from Architect and Owner.
  - b. Carefully remove, clean, and deliver to Owner items indicated on Drawings.
  - c. Relocate commemorative plaques and monuments where indicated on drawings or as directed by Architect in the field.
  - d. Remove, temporarily store and reuse existing brick for re-pointing and masonry repair work where appropriate and approved for use by Architect and Owner's Representative. Properly dispose of any unused material.
  
- D. Disposal of Demolished Materials
  1. At a minimum, weekly, remove from building site debris, rubbish, and other materials resulting from demolition operations.
    - a. If hazardous materials are encountered during demolition operations, notify the Architect and Owner's Representative immediately, before proceeding with demolition. Comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
    - b. Burning of any removed materials is not permitted on Project Site.
  
  2. Removal: Transport materials removed from project location, recycle, and/or legally dispose of off-site.
  
- E. Patching and Repairs: Refer to Division 01 – Cutting and Patching for repair requirements. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction damaged by work activities. Replace damaged surfaces soiled or damaged by demolition work.
  1. Repair Materials: Use repair materials identical to existing materials. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. Submit samples of proposed repair materials to Architect for review and approval.
  2. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
    - a. Completely fill holes and depression in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
    - b. Infill roof openings to match the adjacent roof structure and surface.
    - c. Provide supplemental framing fastened to existing structure to support roof openings or headers / lintels for masonry openings to provide a clear span aligning with adjacent surfaces / systems.
  
  3. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in manner eliminating evidence of patching and refinishing.

- a. Patch and repair floor and wall surfaces in new space where demolished walls or partitions extend from one finished area into another. Provide flush and even surface of uniform color and appearance.
  - b. Closely match texture and finish of existing adjacent surface. Patch with durable seams that are as invisible as possible.
  - c. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after surface has received primer and second coat. Finish entire sections of walls from corner-to-corner, unless otherwise approved by Architect.
  - d. Remove entire existing floor and wall coverings and replace with new materials to achieve uniform color and appearance, unless otherwise approved by Architect.
4. Patch, repair and re-hang existing ceilings as necessary to provide even-plane surface of uniform appearance.

### **3.4 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, rubbish and other materials resulting from the removals and demolitions from the building and site immediately; transport and legally dispose of materials off-site. Disposal method shall be in accordance with City, State, and Federal regulations. Items to be retained by the Owner shall be delivered to locations indicated in the Article titled "Ownership of Materials".
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

### **3.5 CLEANING**

- A. Sweep building broom clean at end of each workday and on completion of selective demolition operations.
- B. Upon completion of demolition, remove tools, equipment, and demolished materials from Site. Remove protections and leave interior areas broom clean. Change filters on air-handling equipment to remain.

### **3.5 OWNERSHIP OF MATERIALS**

- A. All equipment, materials, and items removed shall remain the property of Owner, if desired; equipment, material and items not desired to be re-used or retained by the Owner shall be removed from the site by the Contractor. The Owner will designate which equipment, materials and items will be retained.
- B. The items, equipment and materials listed in this Paragraph shall be removed and salvaged by the Contractor for future use by the Owner. Document package & transport the items to the appropriate location as designated by Owner. Refer to specification section 024200 Removal and Salvage of Construction Materials for more information. Items shall include:

Quantity	Item	Existing Location	Location To Be Delivered To
Refer to drawings	Existing doors and hardware to be removed	Refer to drawings	As determined by the owner
As determined by the owner in the field	As defined by the owner in the field	As determined by the owner in the field	As determined by the owner in the field

END OF SECTION - 024100

**SECTION 024120 - SELECTIVE SITE DEMOLITION**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. General Conditions, Supplementary Conditions and Division 01-General Requirements, apply to work of this section.

**1.2 WORK INCLUDED**

- A. Demolish, except as specifically excluded by provisions of this section:
  - 1. Existing work obstructing new work.
  - 2. Existing work indicated on Drawings to be removed.
  - 3. Existing work below grade obstructing new construction.
- B. Remove from the project site, and dispose of in a legal manner, materials and equipment removed as selective demolition work, except:
  - 1. Materials and equipment to be incorporated into new work.
  - 2. Materials and equipment to be delivered to Owner.
- C. Phasing: Perform selective demolition in phases as required by Owner's use of portions of the site. Coordinate pavement demolition with the owner to ensure that portions of the site remain accessible.
- D. Install 6 - foot high temporary construction security fencing around the perimeter of all construction areas to protect the general public. An exact amount of fencing may not be shown on the drawings and the Owner reserves their right to require as much fencing as needed to maintain construction site safety and security. As a minimum, the Contractor shall provide enough temporary construction fencing to encompass the entire limit of disturbance as noted on the Soil Erosion & Sediment Control Plan. All active work areas shall be fenced to prevent public access until such time as all surfaces are restored to a safe and uniformly graded condition.

**1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 01: Cutting and Patching
- C. Division 01: Selective Demolition (for building elements)

**1.4 SUBMITTALS**

- A. Schedule of Operations: Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection, in sufficient detail to ensure uninterrupted progress of Owner's on-site operations.
- B. Details: Provide schedule for site demolition to the Owner and Architect and adjust same accordingly, based upon work being performed on the site under other contracts.

## **1.5 QUALITY ASSURANCE**

### **A. Qualifications:**

1. **Supervision:** Perform selective demolition under the direct supervision of a qualified construction superintendent, experienced in type of construction involved.
2. **Skills:** Where selective demolition terminates at existing work to remain, perform work using craftsmen skilled in materials and systems involved.

### **B. Pre-demolition Work:**

1. Engage the services of a private underground utility location company to mark the location of all underground utilities present within construction areas and at least 50 feet beyond.
2. Compare the utility locations shown on the Existing Conditions plan with those locations marked in the field. Using a licensed professional land surveyor, survey the location of any utility found to be in a significantly different location, a location not identified on the plan, or in a location that will conflict with future construction. Provide a drawing (to scale) to the Engineer illustrating the utility locations found in the field, versus those represented on the Existing Conditions Plan.
3. **Test Pits:** Perform open excavation test pits in areas noted on the plans and where ground penetrations will occur proximate to utilities shown on the plans or as marked out in the field per subpart 1.5.B.1 above. Also perform open excavation test pits in areas where new utility or other construction work is proposed proximate to underground utilities shown on the construction drawings or as identified during the mark-out described in subpart 1.5.B.1 above. Include up to four (4) discretionary test pits when/if required by the Engineer, to verify the depth, size, and alignment of underground utilities that may be in conflict with future construction or are found to be located significantly different than the Existing Conditions plan depicts. In all cases where test pits are performed, survey the size, depth, and alignment of the unearthed utility(ies) present and report this information to the engineer (overlay this information on a copy of the Existing Conditions plan).
4. Use vacuum excavation procedures when excavating test pits within 20 feet of a marked gas main or service pipe.
5. All utilities shall be field verified by the contractor and this information shall be presented to the Engineer not less than 2 weeks prior to the ordering of materials, or the procurement of equipment related to the installation of underground utilities.

### **C. Compaction of Demolition Areas.**

1. The Owner shall engage a Geotechnical Engineer, licensed in the State of New Jersey, to oversee and certify all compaction. The Contractor shall ensure that the Geotechnical Engineer is present during all earthwork operations. Comply with the field instructions given by the soils engineer as it pertains to the demolition and backfilling of subsurface features. The geotechnical engineer shall be present to verify the compaction of all backfill, fill, and other earthwork relative to disturbance caused by demolition work.

## **1.6 PROJECT CONDITIONS**

- A. Coordinate this work with the work of other sections to avoid any delay or interference with other work.
- B. **Condition of Structure(s):** By submitting its bid, the Contractor represents that it has fully examined the conditions of the building(s), grounds, and surrounding areas. The Owner assumes no responsibility for actual condition of items or structure(s) to be selectively demolished.

1. Conditions existing at time of inspection for bidding will be maintained by Owner insofar as practicable. However, variations within the site and surrounding structures may occur by Owner's daily use of the premises prior to start of selective demolition work. No claims for additional cost due to such variations shall be considered.
2. The Contractor shall continually assess the structural adequacy of nearby structures as demolition proceeds and conditions are uncovered. If previously unseen or unknown structural elements are encountered, promptly advise the Owner and Engineer and wait for instructions before proceeding further.
3. The contractor shall photograph and catalog the structural condition of each adjacent structure, paying particular attention to the condition of existing foundations, evidence of cracks, poor condition of masonry, or other poor site conditions that exist before demolition and construction begins. The purpose of this exercise is to obtain a record of adjacent site conditions before work begins, in order to evaluate potential future claims of property damage caused by vibrations, noise, seismic disturbances, or direct impact. NOTE: The contractor is encouraged to video record the condition of the property in addition to obtaining a photographic record.
4. The contractor shall periodically assess the structural condition of adjacent structures throughout demolition and construction, in order to ensure that the condition of the structure is not being compromised. The contractor shall repair any damage to adjacent structures, to the satisfaction of the Owner and the local Building Department, at no additional cost to the Owner.
5. If the contractor fails to photographically document the condition of existing structures as noted above, then, by default, he assumes all responsibility for mitigating claims of property damage. Photographically documenting the condition of existing facilities does not relieve the contractor from any responsibility for repairing subsequent damage to the facility. The contractor will be held responsible for repairing any property damage that can be justifiably linked to the contractor's demolition or construction activities.

C. Protection:

1. Provide protective measures as required to provide free and safe passage of persons to and from occupied portions of the site and around areas of demolition.
  - a. Ensure that adequate illumination, exit signs and warning signs, included as Temporary Facilities work, are in place whenever such passage is required.
  - b. Ensure that all areas adjacent to work areas are kept in a clean and safe condition at all times. Install temporary construction fencing as needed, and as directed by the owner to ensure the safety of the public.
  - c. If pavements or other hard surfaces are to be removed in public areas, and not immediately restored, install temporary bituminous pavement patch flush with all surfaces and uniform in grade, and maintain said patch until permanent hard surfaces are installed.
2. Provide necessary shoring, bracing, and support to prevent movement, settlement, or collapse of structures or elements adjacent to areas being demolished, and adjacent facilities and structures to remain.
3. Protect existing finished work to remain in place that becomes exposed during demolition operations from damage.
4. Protect existing curbing, pavement, fencing and walls that are designated to remain. Terminate demolition at clean control joints or if joints or seams are not present, carefully sawcut materials to provide a mend-able edge that can be re-secured or otherwise treated for assimilation into future work or work to remain.
5. Provide temporary weather protection during interval between demolition, removal of existing construction on exterior surfaces and installation of new construction, to ensure that no water leakage or weather-related damage occurs to exterior or interior areas of existing building or structure.

- D. Traffic: Conduct demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Comply with requirements of authorities having jurisdiction.
- E. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Do not interrupt existing utilities serving occupied or facilities in use, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
  - 1. If utility systems, including mechanical or electrical systems, are encountered, that are not indicated to remain but give evidence of being in use, promptly advise the Owner and Engineer for instructions before proceeding.
- F. Advise the Owner, in writing, of encounter with materials suspected to be of a hazardous nature. These materials are not to be handled or removed under this Contract.

## **PART 2 – PRODUCTS**

### **2.1 TEMPORARY CONSTRUCTION FENCE**

- A. Furnish and install temporary metal construction security fence, 6 feet high, with lockable access gates at appropriate locations that facilitate work and site access. All active work areas shall be fenced from the general public to prevent trespass. Provide vehicle access gates and man gates as needed to accommodate the work. Provide locks and chains as needed to secure gates to each active work area and provide 2 extra sets of padlock keys to the Owner. Minimum fence shall be galvanized steel, chain link, 11-gauge, 2-inch mesh opening, with medium duty rails and posts. Location of fence shall be reviewed with Architect and Owner on site to determine final location, layout, and placement limits.
- B. All fencing shall be checked daily for damage or sharp edges and mended accordingly.

### **2.2 BACKFILL VOIDS FROM DEMOLITION**

- A. Backfill voids resulting from demolition work with Dense Graded Aggregate per New Jersey Department of Transportation specifications. See Earthwork specification for additional requirements.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas in which work is to be performed. Report to the Owner all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting work constitutes acceptance of the existing conditions and the Contractor shall then be responsible for correcting all unsatisfactory and defective work encountered at its expense.
- C. The following is repeated from another section in these specifications to ensure that the contractor recognizes this provision of the contract:

1. The contractor shall photograph and catalog the physical condition of each structure adjacent to work areas, paying particular attention to the condition of existing foundations, evidence of cracks, poor condition of masonry, or other poor site conditions that exist before demolition and construction begins. The purpose of this exercise is to obtain a record of adjacent site conditions before work begins, in order to evaluate potential future claims of property damage caused by vibrations, noise, seismic disturbances, or direct impact. NOTE: The contractor is encouraged to video record the condition of the property in addition to obtaining a photographic record.
2. The contractor shall periodically assess the structural condition of adjacent structures throughout demolition and construction, in order to ensure that the condition of the structure is not being compromised. The contractor shall repair any damage to adjacent structures, to the satisfaction of the Owner and the local Building Department, at no additional cost to the Owner.
3. If the contractor fails to photographically document the condition of existing structures as noted above, then, by default, it assumes all responsibility for mitigating claims of property damage. Photographically documenting the condition of existing facilities does not relieve the contractor from any responsibility for repairing subsequent damage to the facility. The contractor will be held responsible for repairing any damage that can be justifiably linked to the contractor's demolition or construction activities.

### **3.2 PREPARATION**

- A. Prior to commencement of work, the Contractor and Owner shall inspect respective demolition areas and:
  1. Tabulate and, if appropriate, photograph (and video record if feasible) existing conditions which could be misconstrued as damage resulting from selective demolition work and,
  2. File record photographs and video with Owner prior to starting work and,
  3. Confirm that items to be removed by the Owner have been removed.
  4. Contact appropriate utility companies to schedule utility location mark-outs. The contractor shall also engage the services of an independent utility location service to identify and locate all utilities within the scope of construction. All costs associated with the location of utilities shall be borne by the contractor. Maintain mark-out throughout the duration of construction.

### **3.3 SITE DEMOLITION**

- A. General: Perform work using methods which comply with governing regulations, and which produce proper surfaces to receive new work.
- B. Concrete and Masonry: Demolish in small sections. Cut at junctures near construction to remain by using power-driven saws or hand tools; do not use power-driven impact tools.
- C. Locate equipment and promptly remove debris to avoid imposing excessive loads on structure.
- D. Remove large components and lower to ground by means of hoists, derricks, or other methods which afford complete control.
- E. Exterior demolition work: Make necessary provisions to ensure continuous watertight integrity of work to remain.
- F. Explosives: Use of explosives is not permitted.

### **3.4 DUST CONTROL**

- A. Comply with governing regulations pertaining to prevention of raising excessive dust and dirt.



- B. Use water sprinkling, temporary enclosures, and other suitable methods to minimize amounts of dust and dirt rising and scattering in the air.
  - 1. Do not use water sprinkling when it may create hazardous or objectionable conditions such as ice, flooding, polluted runoff, or damage.

### **3.5 SALVAGE MATERIALS**

- A. Verify that the owner has salvaged all materials from the site that they want to retain.
- B. Carefully dismantle (retain hardware and fasteners in re-sealable containers) all features that the owner asks to retain. Store salvaged materials off site and/or deliver salvaged materials to a location specified by the owner.

### **3.6 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Remove debris, rubbish and other materials resulting from demolition operations from project site. Do not bury demolished materials on the project site. Transport and legally dispose of materials off site.
- B. On site burning of removed materials is not permitted.
- C. Storage or sale of removed materials shall not be permitted on the site, except storage of materials to be re-used or furnished to Owner.

### **3.7 CLEAN-UP AND REPAIR**

- A. Return structure(s) and surfaces to remain to condition existing prior to start of demolition work. Repair adjacent construction and surfaces soiled or damaged by excessive demolition work to original or better condition.
- B. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave work areas broom clean.

### **3.8 TEMPORARY CONSTRUCTION FENCING**

- A. Embed fencing in earth or provide freestanding base units that are stable to withstand overturning. The maximum gap between the bottom of fence and ground shall be 3 inches.
- B. Secure and guy fencing as needed to provide a contiguous perimeter around all work areas.

END OF SECTION - 024120

## **SECTION 024200 - REMOVAL & SALVAGE OF CONSTRUCTION MATERIALS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Removal and demolition of selected items from selected areas of the existing buildings as indicated on the drawings, and as required to complete the work and the project objectives.

#### **1.2 SELECTIVE DEMOLITION/SALVAGE:**

- A. Provide selective removals, and salvage in accordance with the Contract Documents.
  - 1. Document with drawings and photographs keyed to drawings and label elements and materials designated for salvage.
  - 2. Provide temporary shoring as required to ensure stability of building elements and fabric to remain.
  - 3. Provide protection as required to protect both elements and materials to be removed and salvaged and elements and materials to remain from damage or deterioration.
  - 4. Remove and salvage all items as indicated on drawings and in technical provisions.
  - 5. Package and crate items to be salvaged, providing labels and tags.
  - 6. Deliver items to be restored and reinstalled to locations indicated or designated for restoration or storage.
  - 7. Deliver items to be salvaged but not reinstalled to locations designated by Owner.

#### **1.3 QUALITY ASSURANCE**

- A. Submit the following:
  - 1. Submit a schedule indicating proposed methods and sequence of operations for selective removal and salvage work prior to commencement of operations.
- B. Selective Demolition/Salvage:
  - 1. Qualification Data: Qualification data for firms and personnel specified in "Quality Assurance" Article that demonstrates that both firms and personnel have capabilities and experience complying with requirements specified for firm and foreman, provide a list of at least three completed projects within the State where the project is located of similar in size and scope to the work required on this project. For each project list project name, address, architect, scope of contractor's work, and other relevant information. This information shall be submitted with the bid.
  - 2. Selective Demolition, Removal and Salvage Program: Detailed description of

methods and procedures, equipment, tools, and materials proposed for use in removal and salvage operations including, but not limited to, the following:

- a. Documenting and identifying elements and materials to be removed.
- b. Procedures for controlling noise and dust.
- c. Releasing or freeing materials and elements from existing construction.
- d. Protection for elements to be removed and for elements to remain.
- e. Handling and transporting materials and elements removed.
- f. Packaging elements to be removed.
- g. Storage locations.
- h. Tools and methods of removing/salvaging items as indicated.

3. Documentation Photographs: Submit photographs electronically with a minimum resolution of 3 megapixels, recording condition of elements to be removed and salvaged (including overall views and close-up views of any cracks, damage, deterioration, or missing elements) before beginning selective demolition, removals, and salvage work.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Protections: Provide temporary barricades and other forms of protection required to protect railroad personnel, and general public from injury due to selective removals and demolition work.
  1. Provide protective measures as required to provide free and safe passage of personnel.
  2. Protect from damage existing finish work that is to remain in place and which becomes exposed during operations.
- B. Damages
  1. Promptly repair any and all damages to all property and finishes caused by the removals and demolition work, to the Architects / Engineer's satisfaction.

#### **PART 2 PRODUCTS – NOT USED**

#### **PART 3 EXECUTION**

##### **3.1 EXAMINATION**

- A. Prior to commencement of the selective removals and work, inspect the areas in which the work will be performed. Determine and list the existing conditions of rooms or area surfaces and equipment. After the Work in each respective area is completed, determine if adjacent surfaces or equipment have been damaged as a result of the Work; if so, the

damage shall be corrected at the Contractor's expense.

### **3.2 PREPARATION**

- A. LAWS AND REGULATIONS: All work shall comply with all safety requirements of the State and City where the work is taking place, including the latest edition of the National Fire Protection Association; and OSHA regulations.

### **3.3 INSTALLATION, GENERAL**

- A. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

### **3.4 CLEAN-UP AND REPAIR**

- A. All areas in which Work was performed under this Section shall be left "broom-clean."

END OF SECTION 024200

## **SECTION 033000 – CAST-IN-PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. Patching material for existing concrete slab on grade.

#### **1.2 SUMMARY**

- A. This section includes but is not limited to the following:
  - a. Extent of concrete work is shown on drawings.

#### **1.3 RELATED SECTIONS**

- A. Division 01 – Specifications
- B. Division 03 – Sealed Concrete
- C. Division 03 - Grout
- D. Division 04 – Unit Masonry
- E. Division 05 – Structural Steel
- F. Division 05 – Metal Fabrications
- G. Division 07 – Joint Sealants
- H. Division 09 – High Performance Painting

#### **1.4 REFERENCES**

- A. American Concrete Institute (ACI):
  - a. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures
  - b. ACI 301 - Specifications for Structural Concrete for Buildings
  - c. ACI 318 - Building Code Requirements for Reinforced Concrete
  - d. ACI 306R - Guide to Cold Weather Concreting.
  - e. ACI 305R - Guide to Hot Weather Concreting
  - f. ACI 302.1R - Guide for Slabs on Grade
  - g. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
- B. American Society for Testing and Materials (ASTM):
  - a. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
  - b. ASTM A185 - Standard Specification for Welded Steel Wire Fabric For Concrete Reinforcement
  - c. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
  - d. ASTM A615- Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - e. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in

the Field

- f. ASTM C33 - Standard Specification for Concrete Aggregates
  - g. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
  - h. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - i. ASTM C94 - Standard Specification for Ready-Mixed Concrete
  - j. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
  - k. ASTM C150 - Standard Specification for Portland Cement
  - l. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete
  - m. ASTM C171- Standard Specification for Sheet Materials for Curing Concrete
  - n. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
  - o. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  - p. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
  - q. ASTM C494 - Standard Specification for Castings, Nickel and Nickel Alloy
  - r. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
  - s. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
  - t. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers
- C. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".
  - D. CRD-C 621 – Corps of Engineers specification for non-shrink grout
  - E. American Association of State Highway and Transportation Officials – referenced standard

## **1.5 SUBMITTALS**

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds and others as required by Architect.
- B. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.
- D. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- E. 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 to describe the work.
  - 1. Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for

Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing diagrams of bent bars, arrangement of concrete reinforcement.

- F. Sustainability & Environmental Submittals:
  - 1. Indoor Environmental Quality – provide VOC compliant materials in the state and jurisdiction the project is located.
  - 2. Provide products, where possible, that are manufactured within a 500-mile radius of the project site and are considered to be a locally produced material which supports regional materials and resources.
  - 3. Comply with recycling program and waste management procedures required by the local jurisdiction.
  
- G. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
  - 1. CLOSEOUT DOCUMENTS AND PROCEDURES.
  - 2. OPERATION AND MAINTENANCE DATA;
  - 3. PROJECT RECORD DOCUMENTS;
  - 4. DEMONSTRATION AND TRAINING.

## **1.6 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
  - 1. ACI 302.1R "Guide for Slabs on Grade".
  
- B. Provide mock up as directed by Architect and Owner's representative to use as a basis of quality. Minimum area of 4'x4' area in location determined in the field.
- C. Perform a pre-installation (Slab Pre-Pour Meeting) / Conference. Refer to Division 01.
- D. Concrete Testing Service: Owner to retain a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.
  - a. Testing agent Qualifications: A qualified testing agent complying with ASTM C1077 and E329. Field personnel qualified as ACI concrete field technician, grade 1.
  
- E. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.1 FORM MATERIALS**

- A. Provide forms as required for installation of new work and infill work at renovations.
- B. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- C. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable

- material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

## **2.2 REINFORCING MATERIALS**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Welded Deformed Steel Wire Fabric: ASTM A 497.
- E. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

## **2.3 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C 150, Type I or Type II.
1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
- C. Water: Drinkable.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Air-Mix"; Euclid Chemical Co.
    - b. "Sika Aer"; Sika Corp.
    - c. "MB-VR or MB-AE"; Master Builders.
    - d. "Darex AEA" or "Daravair"; W.R. Grace.
    - e. Or approved equal
- E. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.05 percent chloride ions.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "WRDA" Hycol"; W.R.Grace.
    - b. "Eucon WR-75" or "Eucon WR-89"; Euclid Chemical Co.
    - c. "Pozzolith 322N"; Master Builders.
    - d. Or approved equal
- F. High-Range Water-Reducing Admixture (Super Plasticizer) ASTM C 494, Type F or Type G and containing not more than 0.05 percent chloride ions.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Daracem 100" or "WRDA-19"; W.R. Grace.
    - b. "Eucon 37"; Euclid Chemical Co.
    - c. "Rheobuild 1000"; Master Builders.
    - d. "Sika 86"; Sika Corporation.



- e. Or approved equal
- G. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.024 percent chloride ions.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Accelguard 80"; Euclid Chemical Co.
    - b. "Daraset"; W.R. Grace
    - c. Or approved equal
- H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D and containing not more than 0.05 percent chloride ions.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Pozzolith Retarder"; Master Builders.
    - b. "Eucon Retarder 75"; Euclid Chemical Co.
    - c. "Daratard 17"; W.R. Grace.
    - d. "Plastocrete 161R"; Sika Corporation.
    - e. Or approved equal
- I. Prohibited Admixtures: Calcium chloride thycyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

## **2.4 RELATED MATERIALS**

- A. Extruded Polystyrene Board Insulation: Rigid closed-cell extruded, expanded polystyrene insulation board with integral high-density skin, complying with ASTM C-578 Type IV: ASTM D 1621: k value of 0.20 ASTM C 518: 0.30% maximum water absorption ASTM C272: 1.1 perm/inch max water vapor transmission: manufacturer's standard length and widths.
  - 1. Staff Areas of Building - min. 25 psi compressive strength
  - 2. Garage Areas / Driving and heavy storage areas - min. 40 psi compressive strength
  - 3. Manufacturer: Subject to compliance with requirements, provide products of one of the following or an approved equal:
    - a. Dow Chemical Co: Midland MI
    - b. VC Industries/V.5 Gypsum: Chicago, IL.
    - c. "Styrofoam Brand Square Edge" by Dow Chemical Co., Midland, Michigan.
    - d. "Formular 250 or 400" byOwen-Corning Corp., Toledo, Ohio
    - e. Or approved equal
      - a. Refer to Division 07 – Thermal Insulation
- B. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
  - 2. Products: Subject to compliance with requirements provide one of the following:
  - 3. Non-metallic
    - f. "Euco-NS"; Euclid Chemical Co.
    - g. "Duragrout"; L&M Construction Chemicals, Inc.
    - h. "Masterflow 713"; Master Builders
    - i. "Five Star Grout"; U.S. Grout Corporation.

- j. Or approved equal
- C. Absorptive Cover: Burlap cloth made from jute or kenaf weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.
  - 4. Or approved equal
- E. Clear curing and sealing compound (VOC Compliant): The compound shall have 30% solids content minimum, and will not yellow under ultraviolet light after 500 hours of test in accordance with ASTM C-1315 and will have test data from an independent testing laboratory indicating a maximum moisture loss of 0.039 grams per sq. cm. when applied at a rate of 300 sq. ft. per gallon. Sodium silicate compounds are not permitted.
  - 1. Product: "Super Aqua-Cure VOX" by Euclid Chemical Co.
  - 2. Product: "Dress & Seal WB30" by L&M Construction Chemicals, Inc
  - 3. Product: "Kure-n-Seal 30 VOC" by Sonneborne
  - 4. Or approved equal.
    - a. Confirm products proposed for use and approved thru submittal process are compatible with floor finish materials.
- F. Vapor Barrier: Vapor Barrier: Provide vapor barrier which conforms to ASTM E1745, Class A. The membrane shall have a water-vapor transmission rate no greater than 0.01 gr./ft<sup>2</sup>/hr/inch Hg when tested in accordance with ASTM E96. The vapor barrier shall be placed over prepared base material where indicated below slabs on grade. Vapor barrier shall be no less than 15 mil thick. Installation of vapor barrier to comply with ASTM E1643.
  - 1. Product: Stego Wrap (15 mil) Vapor Barrier by Stego Industries LLC
  - 2. Product: VaporBlock (15 mil) by Raven Industries
  - 3. Product: Zero Perm by Alumiseal
  - 4. Product: Premoulded Membrane with PLASMATIC CORE by W.R. Meadows.
  - 5. Or approved equal
    - a. Refer to Division 07 – Thermal Insulation

## **2.5 PROPORTIONING AND DESIGN OF MIXES**

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
- B. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
- D. 5000 psi 28-day compressive strength W/C ratio, 0.42 maximum.

- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be admitted to and accepted by Architect before using in work.
- F. Admixtures:
  - 1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
  - 2. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight and concrete with water/cement ratios below 0.50.
  - 3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
  - 4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits.
    - a. 5% for maximum 2" aggregate
    - b. 6% for maximum 3/4" aggregate
    - c. 7% for maximum 1/2" aggregate
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
  - 1. Ramps, slabs and sloping surfaces: Not more than 3".
  - 2. Reinforced foundation systems: Not less than 1" and not more than 3".
  - 3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.
  - 4. Other concrete: Not less than 1" nor more than 4"

## **2.6 CONCRETE MIXING**

- A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
- B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

## **2.7 ACCESSORY MATERIALS**

- A. Concrete Floor Patching and Leveling Materials acceptable to the finished floor system manufacturer or approved equal: (Select one of the following patching methods to address project field conditions encountered):
- B. Repair products to be used as an underlayment material to receive a floor finish: (in occupied spaces such as offices, break rooms, etc...)
  - 1. Flash Patching: Portland cement-based self-drying cementitious flash patching material similar to "Ardex Feather Finish".
  - 2. Patching: Portland cement-based self-drying cementitious patching material similar to "Ardex SD-P".
  - 3. Self-Leveling Topping: Portland cement-based cementitious self-leveling material similar to "Ardex K-15".
  - 4. Or approved equal

5. Or provide a suitable product for use based on the field conditions encountered. Submit proposed products to Architect and Engineer for review and approval prior to installing the work.
- C. Repair products to be used as a finished wearing surface: (in similar spaces such as storage areas, mechanical rooms, garage areas)
  - a. Flash Patching / Patching: Trowel grade cement-based self-drying cementitious flash patching material similar to Ardex CP "Concrete Patch".
  6. Self-Leveling Topping: Portland cement-based cementitious self-leveling material similar to "Ardex K-500". Product to be sealed with a compatible sealer. Utilize a primer to promote bonding. Product can be installed from .25" to 1.5" thickness without aggregate. Any installation over 1.5" aggregate (pea gravel 1/8" to 3/8") must be added to the mix in the proportions recommended by the manufacturer.
  7. Or approved equal
- D. Prepare, clean, and scarify existing concrete floor to receive patching and leveling products in accordance with the manufacturer's installation instructions and recommendations. Remove all debris, paint material, grease, oil, and stains on concrete slab. Patch floor to level condition with adjacent surfaces. Apply concrete sealer to concrete floor surfaces at the conclusion of the work.
- E. Ensure compatibility of patching material and sealer in writing with submittal.
- F. Install all products in accordance with the manufacturer's installation instructions, procedures, and compatible materials.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify General Contractor in writing, with copies to the Owner's Representative, Owner, and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative, Owner, and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

### **3.2 FORMS**

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structure are of correct size, shape, alignment, elevations and position.

- B. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keywarp, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features, required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

### **3.3 PLACING REINFORCEMENT**

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
  - 1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

### **3.4 JOINTS**

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate at a maximum spacing of 90 feet, so as not to impair strength and appearance of the structure, as acceptable to Architect.
- B. Control Joints: Locate and install control joints as indicated or at a maximum spacing of 30 feet. Locate at a spacing which does not impair appearance of the structure as acceptable to Architect.
- C. Joint filler and sealant materials are specified in Division-7 sections of these specifications.

### **3.5 INSTALLATION OF EMBEDDED ITEMS**

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms, or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of

strike-off templates or accepted compacting type screeds.

### **3.6 CONCRETE PLACEMENT**

- A. Preplacement inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moistened wood forms immediately before placing concrete where form coatings are not used.
  - 1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
- B. General: Comply with ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified.
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
- E. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- F. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- G. Maintain reinforcing in proper position during concrete placement operations.
- H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which would be caused by frost, freezing actions or low temperatures, in compliance with ACI 306R.
- I. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R.

### **3.7 MONOLITHIC SLAB FINISHES**

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
- B. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F(f)18 – F(l)15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after

- leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
  - D. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled per ASTM E1155 to tolerances of F(f)20 – F(l)17. Grind smooth surface defects which would telegraph through supplied floor covering system.
  - E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.

### **3.8 CONCRETE CURING AND PROTECTION**

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- D. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing and by combinations thereof to comply with ACI 308R, as herein specified.
- E. Provide moisture curing by following methods.
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Continuous water-fog spray.
  - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- F. Provide moisture-cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, place in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- G. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to Architect.
- H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- I. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

### **3.9 MISCELLANEOUS CONCRETE ITEMS**

- A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

### **3.10 CONCRETE SURFACE REPAIRS**

- A. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- B. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.
- C. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- D. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
- E. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material.

### **3.11 QUALITY CONTROL TESTING DURING CONSTRUCTION**

- A. The Owner will employ a testing laboratory to perform the following tests, inspect formwork and reinforcement placement and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete will include the following, as directed by Architect.
- C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
- D. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
- E. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu.



- yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- F. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  - G. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
  - H. Nondestructive Testing: Impact hammer, sonoscope or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
  - I. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 033000

**SECTION 033000.01 - CONCRETE FORM WORK (SITEWORK)**

**PART 1 – GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

**1.2 SECTION INCLUDES**

- A. Provide formwork for cast-in-place concrete work not specified in other Divisions.
  - 1. Work includes design and engineering of formwork for site work improvements and related concrete.
  - 2. Do not use earth cuts as forms for vertical surfaces, except as specifically reviewed by Engineer.
  - 3. Earth forms may be used for footings if banks are stable.

**1.3 RELATED SECTIONS**

- A. Division 03: Cast-in-Place Concrete
- B. Division 03: Concrete Paving.

**1.4 REFERENCE STANDARDS**

- A. ACI American Concrete Institute:
  - 1. 318 Building Code Requirements for Reinforced Concrete.
  - 2. 347 Recommended Practice for Concrete Formwork.
- B. ASTM American Society for Testing and Materials:
  - 1. ASTM Standard Specifications and Test Methods referenced in Part 2 - Products and Part 3 - Execution.

**1.5 SUBMITTALS**

- A. Product Data: Submit data for formwork materials and accessories, as requested by Engineer.

**1.6 REGULATORY REQUIREMENTS**

- A. Comply with the applicable provisions of codes, standards and specifications referenced in this section.

**PART 2 – PRODUCTS**

**2.1 FORM MATERIALS**

- A. Forms for Exposed Concrete: Except where special formwork is required to produce surface characteristics indicated or specified, construct with plywood, metal, metal framed plywood or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Provide material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Plywood: Comply with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I and II, Exterior Grade, not less than 5/8 inch thick, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.
- B. Forms for Unexposed Concrete: Plywood, lumber, metal or other acceptable material. Where lumber used, it shall be nominal 1 inch x 6 inches or 1 inch x 8 inches, dressed on 2 edges and one side for tight fit.

## **2.2 FORMWORK ACCESSORIES**

- A. Form Release Agents: Use commercial formulation compounds that cannot bond with, stain nor adversely affect concrete surfaces, and cannot impair subsequent treatments of concrete surfaces.
  1. Reference Product:
    - a. "Formshield" by W.R. Grace Co.
    - b. Approved Equal.
- B. Form Ties: Snap-off metal, adjustable-length, cone type, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
  1. Provide ties with 1-1/2 inches breakback dimension, with a maximum hole size of 7/8 inch diameter in concrete surface.
- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

## **PART 3 – EXECUTION**

### **3.1 DESIGN AND ERECTION**

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads until such loads can be supported by concrete structure. Construct formwork so concrete members are of correct size, shape, alignment, elevation and position as shown, and within tolerances permitted by ACI 301.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
- C. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
- D. Use selected materials to obtain required finishes. Solidly butt and back-up joints to prevent leakage of cement paste.
- E. Chamfer exposed corners and edges when both surfaces are exposed in the finished work, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

### **3.2 OPENINGS, INSERTS, AND EMBEDDED WORK**

- A. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection, and for placement of concrete. Securely brace temporary openings and set tight to forms to prevent loss of concrete mortar. Locate temporary openings at inconspicuous locations.

- B. Provide openings in formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- C. Set and build in to formwork anchorage devices, reglets, and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

### **3.3 JOINTS**

- A. Locate and install as indicated; if not indicated, locate so as not to impair strength and appearance of the structure, and as reviewed by Engineer.
  - 1. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

### **3.4 PREPARATION OF FORM SURFACES**

- A. Clean re-used forms of concrete matrix residue; repair and patch as required to return forms to acceptable surface condition.
- B. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and to maintain proper alignment.
- C. During cold weather, remove ice and snow from forms. Do not use deicing salts. Do not use water to clean out completed forms, unless formwork and construction are within heated enclosure; use compressed air to remove foreign matter.
- D. Coat contact surfaces of forms with form release agent before reinforcement is placed. Apply in accordance with manufacturer's directions.
  - 1. Do not allow excess form release agent to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete shall be placed.
  - 2. Coat steel forms with a non-staining, rust-preventive form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### **3.5 FORM REMOVAL**

- A. Remove formwork only after both the following minimum concrete ages and percentages of design strength have been reached, and as further specified below:

ELEMENT	AGE	STRENGTH
Vertical Surfaces	6 days	60 percent
Footings	2 days	35 percent
Other work	When concrete is self-supporting.	

- B. Time Reduction: When high early strength concrete is used, specified time periods may be reduced when a written review has been sent to the Engineer.

- C. Vertical Surfaces: Formwork not supporting weight of concrete may be removed in specified time only if cumulative curing time at not less than 50 degrees F is not less than 24 hours; and provided concrete has sufficiently hardened to prevent damaged by form removal operations, and provided curing and protection operations are maintained.

END OF SECTION – 033000.01

**SECTION 033000.02 – CONCRETE REINFORCEMENT (SITEWORK)**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

**1.2 SECTION INCLUDES**

- A. Provide reinforcing for cast-in-place concrete work for site work improvements.
- B. Provide inspection and testing related to reinforcing.

**1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 03: Cast-in-Place Concrete – for Sitework Improvements.
- C. Division 03: Concrete Formwork – for Sitework Improvements.
- D. Division 32: Reinforcing for concrete paving and walks.

**1.4 REFERENCED STANDARDS**

- A. ACI American Concrete Institute:
  - 1. 301 - Specifications for Structural Concrete for Buildings.
  - 2. 315 - Manual of Standard Practices for Detailing Reinforced Concrete Structures.
  - 3. 318 - Building Code Requirements for Reinforced Concrete.
- B. CRSI Concrete Reinforcing Steel Institute:
  - 1. Manual of Standard Practice.
- C. ASTM American Society for Testing and Materials:
  - 1. Standard Specifications and Test Methods referenced in PART 2 - PRODUCTS and PART 3 - EXECUTION.

**1.5 SUBMITTALS**

- A. Product Data: Submit data for reinforcement accessories, as requested by Architect.
- B. Compliance: Submit material certifications, signed by manufacturer and Contractor, that each material item complies with or exceeds specified requirements.

- C. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315. Show bar schedules, stirrup spacing, bending details, and arrangement of reinforcement. Include special reinforcement required at openings through concrete work.
  - 1. Shop drawings shall be sufficiently complete to enable reinforcing to be placed according to, but without reference to, the Construction Drawings, and shall identify and clearly show supports. Include details showing complicated reinforcing arrangements at 1/4 inch to 1'-0" scale or larger.

## **1.6 QUALITY ASSURANCE**

- A. Identification: Each reinforcing bar shall have an embossed identifying symbol indicating that steel is of the grade specified. Steel without such a symbol shall be rejected.
- B. Inspection: Reinforcing shall be inspected and approved by an independent testing and inspection agency before concrete is placed.

## **1.7 REGULATORY REQUIREMENTS**

- A. Comply with the applicable provisions of codes, standards and specifications referenced in this section.

## **1.8 PRODUCT HANDLING**

- A. Ship reinforcing steel to the job site in standard bundles, tagged with embossed zinc shipping and marking tags, prepared in accordance with CRSI "Manual of Standard Practice".
- B. Sort reinforcement upon delivery to the site; store to avoid contact with the ground, and in a location protected from vehicular traffic.
- C. Cover reinforcement remaining in storage on the site for more than one month, to protect it from the weather.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with requirements, provide listed products of one of the manufacturers listed for each product type.

### **2.2 MATERIALS**

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A775.
- C. Welded Wire Fabric: ASTM A185, fabricated from ASTM A82, plain cold-drawn steel wire. Sizes as shown, but not lighter than 6 x 6-W2.9 x W2.9. Deliver in flat sheets, not rolls.
- D. Supports for Reinforcement: Provide bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Supports shall be sized and spaced to prevent cover loss during construction. Use wire bar type supports complying with CRSI specifications.

1. For exposed-to-view concrete surfaces, support legs in contact with forms shall be plastic, plastic protected (CRSI, Class 1), or stainless steel protected (CRSI, Class 2).

E. Tie Wire: Black annealed wire, 16 gage or heavier.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Comply with CRSI "Recommended Practice for Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as specified.
- B. Clean reinforcement before placing, to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete. Remove and replace reinforcement reduced in section by rust or damage.
- C. Accurately position, support, and secure reinforcement against displacement by construction or concrete placement and consolidation operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers; and by wire tying at intersection. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- D. Place reinforcement to provide concrete coverages not less than those specified by ACI, and greater coverages if shown or specified.
- E. Do not bend or straighten reinforcement in a manner injurious to the material. Do not install bars with kinks or bends not shown on Drawings. Heating of reinforcement for bending or straightening is not permitted.
- F. Install reinforcing in the forms before concrete is placed. No reinforcing bars shall be driven or forced into concrete after the concrete has attained its initial set.
- G. Scheduling: Place reinforcement sufficiently in advance of placing concrete to permit inspection, and correction if required. Do not place top layer of deck reinforcing until concealed horizontal conduits and piping are in place.
- H. Use bars of single length, except where the length required is greater than stock length, or where the Architect gives permission for shorter lengths. Lap necessary splices as shown on the Drawings sufficiently to develop the strength of the bars by bond. Lap splices shall be in accordance with ACI 318. No splices shall be made unless shown on the Engineering Drawings and Architect's reviewed shop drawings. Where continuous bars are called for lap splices shall be a minimum of 36 diameters.
- I. Exercise care in placing reinforcing so as not to displace sleeves, boxing, or other embedded items.
- J. Welding shall conform to the AWS "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction".
- K. Install welded wire fabric in longest lengths practicable. Lap adjoining pieces not less than 6 inches and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- L. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations.



**3.2 INSTALLATION DETAILS**

- A. At wall intersections, extend horizontal rods at inner face to the far face of the wall, and bend horizontal rods at the outer face thirty-six (36) bar diameters around the corner unless otherwise shown on the Drawings. Lapping "L" shaped corner bars may be substituted at the other face unless prohibited by notation on the Drawings.
- B. At openings, provide additional reinforcing equal to the interrupted bars, placed equally on each side of the opening.
- C. At footings, provide dowels equal in size, spacing and number to the reinforcing in the columns, pedestals or walls which they support.
- D. Details of reinforcement not specified or shown on the Drawings shall be in accordance with ACI 318 and ACI 315.
- E. Reinforcement used as dowels at doorways shall be pinned into the building foundation to prevent differential settlement and frost heave. The dowel set into the adjacent concrete slab shall be de-bonded to allow for thermal expansion of the slab. One acceptable method of de-bonding is to slip a section of galvanized pipe over the rebar within the concrete slab before pouring same

END OF SECTION – 033000.02

**SECTION 033950 – SEALED CONCRETE PRODUCTS**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Section Includes, but is not limited to:
  - 1. Sealer compounds applied to concrete floors (new or existing).
  - 2. Concrete densifier and sealer.
  - 3. Patching material for existing concrete slab on grade.
- B. Related Section
  - 1. Division 03 – Cast in Place Concrete

**1.2 REFERENCES**

- A. ISO 9001/9002 registered
- B. ANSI Registrar Accreditation Board (ANSI-RAB)
- C. EPA 40 CFR Part 59, Table 1, Subpart D for concrete protective coatings.
- D. Meets California and New Jersey air quality standards – no VOC's

**1.3 DEFINITIONS**

- A. “New Concrete”: Freshly place concrete.
- B. “Old Concrete”: Concrete that has been cured for minimum 28 days.

**1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
- C. Sustainability & Environmental Submittals:
  - 1. Indoor Environmental Quality – provide VOC compliant materials in the state and jurisdiction the project is located.
  - 2. Provide products, where possible, that are manufactured within a 500-mile radius of the project site and are considered to be a locally produced material which supports regional materials and resources.
  - 3. Comply with recycling program and waste management procedures required by the local jurisdiction.
- D. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
  - 1. CLOSEOUT DOCUMENTS AND PROCEDURES.
  - 2. OPERATION AND MAINTENANCE DATA;
  - 3. PROJECT RECORD DOCUMENTS;
  - 4. DEMONSTRATION AND TRAINING.

**1.5 QUALITY ASSURANCE**

- A. Regulatory Requirements

1. VOC Compliance: Provide products not exceeding applicable state or federal limitations applicable in location products are applied.
2. Manufacturer's Qualifications: ISO 9001/9002 registered or provide proof of documented quality assurance system. Quality assurance system shall be registered by independent registrar accredited by ANSI Registrar Accreditation Board (ANSI-RAB) or by another internationally recognized body.

**B. Field Samples**

1. In location designated by Architect, apply concrete sealer in accordance with applicable manufacturer's application instructions and obtain Architect's acceptance of 50 square feet field sample application prior to beginning full application as shown on Drawings. Field sample may be incorporated into work if acceptable to Architect.

**C. Installer Qualifications: A Firm / Installer with a minimum of 5 years successful experience in installation of sealers for a similar size and type of project. Provide list of projects with contact names, Owner's, and project locations.**

**D. Maintenance data**

**1.6 DELIVERY, STORAGE, AND HANDLING**

**A. Packing and Shipping**

1. Deliver concrete sealer products to Site in manufacturer's original unopened containers with all applicable labels intact and readable.

**B. Storage and Protection**

1. Comply with manufacturer's recommendations for storage and protection of sealer products specified in this Section including (but not limited to) temperature restrictions, storage conditions, and similar requirements.
2. Keep containers sealed until ready for use. Keep from freezing.

**C. Handling: Protect materials during handling and application to prevent damage or contamination.**

**1.7 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply sealer when concrete or air temperatures are below 40 degrees F (4 degrees C) or above 135 degrees F (57 degrees C).

**1.8 WARRANTY**

- A. Warranty: Provide manufacturer's standard form product warranty.
  1. Duration: 20 years

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. As a basis of design details and specifications have been based on specified products by following manufacturers:
  1. The Euclid Chemical Company, Cleveland, Ohio.
  2. Other products that may be acceptable upon a compliance review include the following:
    - a. Tamms Industries, Kirkland, Illinois.
    - b. W.R. Meadows, Inc., York, Pennsylvania.
    - c. Or approved equal

## **2.2 MATERIALS**

- A. Sealer Compound for Interior Concrete Floors: Water-based hardener/sealing compound for new or old concrete surfaces. Acceptable products include:
  - 1. "EUCO Diamond Hard" by The Euclid Chemical Co.
  - 2. Other products that may be acceptable upon a compliance review include the following:
    - a. "Hornolith" by Tamms Industries.
    - b. "Liqui-Hard" by W.R. Meadows, Inc.
    - c. Or approved equal
- B. Material Type: Clear, water-based, blend of silicate polymers or approved equal.
  - 1. Compliance Information:
    - (1) Meets maximum VOC content of 400 g/L in accordance with EPA 40 CFR Part 59, Table 1, Subpart D for concrete protective coatings.
    - (2) Meets California and New Jersey air quality standards.
    - (3) VOC Content: 0 g/L.
    - (4) USDA approved.
    - (5) Ultraviolet resistant.
    - (6) Blush resistant.
    - (7) Non-yellowing.
    - (8) No odor.
    - (9) Penetrating.

## **2.3 ACCESSORY MATERIALS**

- A. Concrete Floor Patching and Leveling Materials – For more information refer to: Division 03 – Cast In Place Concrete.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which products of this section are to be installed in coordination with Installer of materials and components specified in this Section and notify the General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions are acceptable to ensure proper and timely installation of the proposed products and confirms requirements for applicable warranty or guarantee can be satisfied; submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Verify surface is free of liquid curing compounds and incompatible products with sealer.

### **3.2 PREPARATION**

- A. Surface Preparation
  - 1. Remove all curing compounds, oils, grease, laitance, dust, and other contaminants. Properly fill or otherwise repair surface defects, voids, joints, cracks or similar irregularities as required or recommended by sealer manufacturer. Ensure surfaces are completely clean, dry, and structurally sound in accordance with sealer manufacturer's requirements and recommendations.

**3.3 APPLICATION**

- A. Prepare concrete surfaces in accordance with manufacturer's instructions.
- B. New Concrete: Do not apply until concrete has cured for at least 28 days. Mix and apply sealer in accordance with sealer manufacturer's recommendations including (but not limited to) coverage rates and application techniques. Provide number of coats recommended by sealer manufacturer for applications and conditions at Site. Provide a minimum of (2) coats unless otherwise required.
- C. Old Concrete: Mix and apply sealer in accordance with sealer manufacturer's recommendations including (but not limited to) coverage rates and application techniques. Provide number of coats recommended by sealer manufacturer for applications and conditions at Site.
- D. Apply sealer to concrete surfaces in accordance with manufacturer's instructions.
- E. Do not leave excess sealer residue on treated concrete surfaces. Remove excess hardened sealer.
- F. Do not use as a curing compound.
- G. Do not dilute sealer.

**3.4 ADJUSTING / CLEANING / PROTECTION**

- A. After completion of application, remove all containers and debris resulting from installation and clean or repair adjacent surfaces damaged by sealer application.
- B. Protect horizontal surfaces from traffic until sealer has cured.
- C. Protect surfaces after application as recommended by sealer manufacturer, including (but not limited to) restricting access to floors for at least 24 hours after installation. Provide additional protection and instruction to all Contractors to ensure finished surface is properly protected during subsequent construction. Immediately prior to turnover to Owner, repair all damaged surfaces, clean surface as required, and reapply an additional coat of sealer.
- D. Dispose of all waste legally and in accordance with local jurisdiction requirements.
- E. Comply with waste management and recycling program requirements.

END OF SECTION 033950

**SECTION 036000 – GROUT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes but is not limited to the following:
  - 1. Unless otherwise specified, provided grouts for the individual grouting requirements stated in other Sections of the Specifications and where noted on the drawings.
  - 2. Grout for concrete masonry units, setting materials, and base plates, etc...

**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 RELATED SECTIONS**

- A. Division 01 – Specifications
- B. Division 03 – Cast-In-Place Concrete

**1.4 REFERENCES**

- A. American Concrete Institute (ACI):
  - 1. ACI 305R, Hot Weather Concreting.
  - 2. ACI 306R, Cold Weather Concreting.
  - 3. ACI 306.1, Standard Specification for Cold Weather Concreting.
  - 4. ACI 308, Standard Specification for Curing Concrete.
- B. American Society for Testing and Materials (ASTM):
  - 1. ASTM C 33; Standard Specification for Concrete Aggregate.
  - 2. ASTM C 109; Test Method for Compressive Strength of Hydraulic Cement Mortars (Using two-inch or 50-mm Cube Specimens).
  - 3. ASTM C 150; Standard Specification for Portland Cement.
  - 4. ASTM C 191; Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
  - 5. ASTM C 596; Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
  - 6. ASTM C 1090; Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout.
  - 7. ASTM C 1107; Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink).

**1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 SUBMITTAL PROCEDURES.
- B. Product Data General: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Non-Shrink Grout.
- C. Design Mix: Prior to production of grout mix, submit for approval all mix designs proposed for project.
- D. Test Report: Submit test reports specified within this specification.

- E. 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 to describe the work.
- F. Maintenance data.
- G. Warranties: Sample of special warranties.
- H. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
  - 1. Recycled content – documentation showing product supports pre and post - consumer content.
  - 2. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  - 3. Proposed products are manufactured within a 500-mile radius of the project site and are considered to be a locally produced material which supports regional materials and resources.
  - 4. Comply with recycling program and waste management procedures.
- I. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
  - 1. Requirements of 017700 CLOSEOUT PROCEDURES.
  - 2. Submission of maintenance instructions described in 017823 OPERATION AND MAINTENANCE DATA;
  - 3. Record documents as described in 017839 PROJECT RECORD DOCUMENTS;
  - 4. Demonstration and training requirements indicated in 017900 DEMONSTRATION AND TRAINING.

## **1.6 QUALITY REQUIREMENTS**

- A. Grout Performance Qualifications: Furnish the grout manufacturer's current independent laboratory test results indicating the grout as non-shrink from time of placement as conforming to the Following:
  - 1. Early height change of 0.0% to 4.0%, according to ASTM C 827.
  - 2. Hardened height change of 0.0% to 0.3% according to ASTM C 1090.
  - 3. Provide a minimum of 4,000 psi strength developed with a trowelable mix within 24 hours when tested in accordance with the requirements of ASTM C 109 modified in accordance with the requirements of ASTM C 1107 and CE-CRD-C621.
  - 4. At bearing plates provide grout product capable of supporting the bearing pressure and stress required by the supporting elements confirmed thru calculation. Product to be submitted with the associated product submittal for: structural steel, metal fabrications, etc...
  - 5. Indicating placement time based on initial set of not less than 60 minutes, according to ASTM C 191.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Handling: Provide protective covering over materials to prevent moisture damage and contamination of grout materials during delivery and handling.
- B. Storage: Store grout materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

## **1.8 PROJECT CONDITIONS**

- A. Environmental Requirements: Protect against high and low temperatures and unfavorable environmental conditions in accordance with requirements of ACI 305R, 306R, and ACI 306.1.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Non-Shrink Non-Metallic Grout:

1. A factory premixed material meeting the performance requirements of ASTM C 1107 (Grades A, B, or C) that contains no corrosive irons, aluminums, chemicals, or gypsums.
    - a. Provide a ready-mix type of grout requiring only the addition of water.
    - b. Do not add other materials to the grout.
    - c. For grout applications not in contact with sewage, provide grout manufactured using Type I (Normal) cement as specified in Division 03.
    - d. For grout applications in contact with sewage, provide grout manufactured using Type II (Sulfate Resistant) cement as specified in Division 03.
  2. Acceptable manufacturers for non-shrink non-metallic grout include the following:
    - a. Five Star Products, Inc.
    - b. US Grout, Corp.
    - c. Euclid Chemical Co.
    - d. Master Builders
    - e. Or approved equal.
- B. Portland Cement:
1. Portland Cement conforming to the requirements of ASTM C 150 Type I or Type II as specified.
    - a. Provide Type II (sulfate resistant) cement for applications in contact with sewage.
- C. Aggregates:
1. Fine aggregate conforming to the material quality requirements of ASTM C 33.

## **2.2 MIXES**

- A. Neat Cement:
1. Use Type I Portland Cement and water in the same proportions specified in Division 03 for Class A cast-in-place concrete but omit the fine and coarse aggregates from the mix.
- B. Sand/Cement Grout:
1. Proportion the proposed design mix using mixture of Portland Cement, fine aggregate, and water in the same proportion specified for Class A cast-in-place concrete in Division 03.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify General Contractor in writing, with copies to the Owner's Representative, Owner, and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative, Owner, and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

### **3.2 PREPARATION**

- A. Preparation of Surface: Clean surfaces to be grouted to be free of oil, grease, laitance, dirt, and other contaminants. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.



1. Additional Preparation: Perform additional surface preparation in accordance with manufacturer's instructions.
- B. Formwork: Use forming procedures that allow proper and complete placement of grout.
  1. Pre-treat wood forms with forming oils so that they do not absorb moisture.
  2. Anchor support elements of formwork so no movement is possible. Remove supports only after grout has hardened.
- C. Grout Mixing: Use power-operated mechanical mixer of sufficient capacity to carry out batch mixing without interruption.
  1. Mix Non-Shrink Grout in accordance with manufacturer's instructions.
  2. Mix Sand/Cement Grout in accordance with requirements specified for mixing Class A concrete in Division 03.

### **3.3 INSTALLATION**

- A. Sand/Cement Grout:
  1. After the surface has been prepared as specified in Paragraph 3.2B, first saturate the surface to be grouted with water, remove any excess water, and then brush on a coat of Neat Cement.
    - a. Place the grout while the Neat Cement is wet.
  2. Place the grout in a single pour and consolidate and finish the grout with a steel trowel.
    - a. In vertical applications, place grout in monolithic pours.
  3. Cure and seal the grout in accordance with ACI 308.
- B. Non-Shrink Non-Metallic Grout:
  1. Place non-shrink non-metallic grout in exposed and unexposed areas at locations indicated on the Contract Drawings.
  2. Mix and place non-shrink non-metallic grout in accordance with the manufacturer's published instructions.

### **3.4 SITE QUALITY CONTROL**

- A. An Independent Quality Assurance Testing and Inspection Agency (Agency) shall be engaged by Owner to perform field inspections, quality control testing, and prepare test reports.
  1. The Agency shall conduct and interpret test results.
  2. Written reports on all tests and inspections shall be provided immediately after work is performed. The reports shall state test specimens either comply with requirements or deviate from them.
- B. Site Tests and Inspections:
  1. During the period when grout is being placed, the Independent Quality Assurance Testing Agency (Agency) must perform testing of materials.
    - a. Advise the Agency sufficiently in advance of operations to allow testing personnel to be assigned and to provide sufficient time for quality tests to be performed and completed.
    - b. Provide and maintain adequate and separate facilities for safe storage and proper curing of grout test samples on the Work Site for the sole use of the Agency.
    - c. Provide containers for transporting grout test samples to the testing laboratory.
    - d. The Agency will perform additional materials testing due to changes in materials or proportions requested by the Construction Manager as required due to failure of material to meet specified requirements.
    - e. Failure of the Agency to detect defective work will not prevent its rejection later when the defect is discovered.

2. Compressive Strength Test:
    - a. Test Procedure:
      - 1) A test sample will be obtained from the first placement of the day and for every 10 cubic yards of grout placed each day.
      - 2) Adjust sample testing based on type of grouting procedures taking place on site.
        - a) Example: Adequately test base plate grouting to ensure grouting material and placement is acceptable if below the 10cu. yd. quantity established above.
      - 3) The grout will be tested in accordance with the requirements of ASTM C 109 modified in accordance with the requirements of ASTM C 1107.
    - b. Acceptance Criteria:
      - 1) Grout meeting the requirements specified in Article 1.5.A.3 will be acceptable.
  3. Inspections:
    - a. All grout placement will be visibly inspected to verify if proper placement procedures are being followed.
- C. Non-Conforming Work
1. Remove under-strength grout and replace the removed grout with grout meeting the specified requirements.

END OF SECTION 036000

## **SECTION 042000 - UNIT MASONRY**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This Section includes unit masonry assemblies consisting of, but not limited to the following:

1. Concrete masonry units (CMUs) including but not limited to the following:

- a. Architectural Masonry Units (Match Existing).
- b. Provide regular and fire rated concrete masonry units.
- c. Provide bull-nose units at interior of building on all outside corners.

2. Brick. (Match Existing).

3. Cast Stone. (Match Existing).

4. Accessories including, but not limited to the following:

- a. Reinforcement and Anchorage
- b. Flashings
- c. Cleaners
- d. Integral water repellants

B. Related Sections:

1. DIVISION 03 – Cast in Place Concrete
2. DIVISION 05 – Miscellaneous Metal
3. DIVISION 06 – Rough Carpentry
4. DIVISION 07 – Air and Moisture Barriers
5. DIVISION 07 – Thermal Insulation
6. DIVISION 07 – Sheet Metal Flashing and Trim
7. DIVISION 07 – Firestopping
8. DIVISION 07 – Joint Sealers
9. DIVISION 08 – HM Doors and Frames

#### **1.2 REFERENCES**

A. Reference Standards: Including, but not limited to the following:

1. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International.
2. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International.
3. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
4. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM C 90 - Standard Specification for Load bearing Concrete Masonry Units.
6. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
7. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

8. BIA Technical Notes No. 10A Rev - Design and Detailing of Movement Joints, Part II of II.
  9. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council.
  10. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.
  11. NCMA TEK 10-2A - Control Joints for Concrete Masonry Walls.
  12. Glazed CMU
    - a. ASTM C744-08 all applicable Federal Specifications
    - b. ASTM C90
    - c. All applicable Federal Specifications
  13. Concrete Stone Veneer
    - a. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures.
    - b. ACI 530.1/ASCE 6/TMS 602 - Specifications for Masonry Structures and Commentaries.
    - c. ASTM A 36 - Standard Specification for Carbon Structural Steel.
    - d. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - e. ASTM A 666 - Standard Specification for Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar
    - f. ASTM C-55 – Standard Specification for Concrete Brick.
    - g. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
    - h. ASTM C 150 - Standard Specification for Portland Cement.
    - i. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
    - j. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
    - k. ASTM C 387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
    - l. ASTM C 568 - Standard Specification for Limestone Dimension Stone.
    - m. ASTM E 514 - Test method for Water Penetration and Leakage Through Masonry.
    - n. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide
    - o. Specification for Hot and Cold Weather Masonry Construction.
    - p. NCMA – National Concrete Masonry Association.
- B. American Concrete Institute (ACI): ACI 30.1-99, Specifications for Masonry Structures (ACI 530.1-99/ASCE 6-00/TMS 602-99)
- C. Brick Institute of America (BIA): Technical Notes on Brick Construction.

### **1.3 SYSTEM DESCRIPTION**

- A. Design Requirements: Conform to requirements of ACI 530.1-99 for masonry construction, except as otherwise specified in this section or on Drawings.
1. Exclude following provisions in ACI 530.1-99:
    - a. Part 2, Article 2.3.C., Part 2, Article 2.3.D., Part 2, Article 2.6.A.4., Part 2, Article 2.7.B.1 through Article 2.7.B.4., Part 2, Article 2.8.C., Part 3, Article 3.3.B.5., Part 3, Article 3.4.F., Part 2, Article 2.1.B.1 and Article 2.1.B.2, Part 2, Article 2.1.C.1

and Article 2.1.C.2, Part 2, Article 2.4.B, Part 2, Article 2.4.G, Part 2, Article 2.4.H, Part 2, Article 3.6

2. Concrete Masonry System Compressive Strength ( $f_m$ ):
  - a. Concrete Masonry with "Type S" Mortar: 1500 psi.
  - b. Concrete Masonry with "Type N" Mortar: 1350 psi.
  - c. Concrete Masonry with "Type M" Mortar: 1900 psi unless otherwise required by Structural Engineer.

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 SUBMITTAL PROCEDURES.
- B. Product Data:
  1. Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified
  2. below as required to demonstrate compliance with specified requirements and provide complete application information.
  3. Provide data for masonry units, fabricated wire reinforcement, and flashing.
  4. Submit information and test data for each type of product indicated to establish compliance with specification requirements.
- C. Shop Drawings – Submit shop drawings for following items showing dimensions, locations, and relationship with adjacent materials and component.
  1. For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show on wall elevations drawn at minimum  $\frac{1}{4}" = 1'-0"$ .
  2. Lintels, shelf angles, and door frames.
- D. Samples for each type and color of exposed masonry units and colored mortars.
  1. Preliminary Selection – Submit two (2) small scale samples each showing full extent of colors and textures available for the following:
    - a. Concrete masonry units
    - b. Architectural Masonry Units
    - c. Colored masonry mortar to match existing
- E. Manufacturer's Material Certificates: Submit certification for each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
  1. For masonry units include material test reports substantiating compliance with requirements.
  2. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

- F. Masonry Accessories: Submit two (2) samples of each specified accessory, including masonry flashing, bond breaker, joint reinforcing, wall ties, and pre-molded control joints.
- G. Masonry anchoring devices including ties, reinforcing, water-stops, flashing, and drip edges.
- H. Masonry Cleaner: Submit recommended cleaning methods, products and procedures required by the masonry product manufacturer for each product specified.
- I. Sustainability & Environmental Submittals:
  - a. Indoor Environmental Quality – provide VOC compliant materials in the state and jurisdiction the project is located.
  - b. Provide products, where possible, that are manufactured within a 500-mile radius of the project site and are considered to be a locally produced to support regional materials and resources.
  - c. Comply with recycling program and waste management procedures required by the local jurisdiction.
- J. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
  - a. CLOSEOUT DOCUMENTS AND PROCEDURES.
  - b. OPERATION AND MAINTENANCE DATA.
  - c. PROJECT RECORD DOCUMENTS.
  - d. DEMONSTRATION AND TRAINING.

## **1.5 QUALITY ASSURANCE**

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
- A. Fire Rated Assemblies: Conform to applicable code for UL assemblies indicated on the drawings, or to match existing conditions.
- B. Qualifications:
  - 1. Manufacturer: Provide single source responsibility for following materials:
    - a. Masonry Units: Obtain exposed masonry units of uniform texture and color or a uniform blend within ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
    - b. Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer, for each cementitious component and from one source and producer for each aggregate.
  - 2. Installer: Minimum ten (10) years of experience in installation of masonry systems with at least five (5) completed projects involving masonry construction similar to scope of work included in this Project and with each type of masonry product proposed.

## **1.6 MOCK-UP**

- A. Construct a masonry wall as a mock-up panel for each masonry product specified. Determine an acceptable location and size of panel in field with Architect. Mock-up to include mortar and accessories, structural backup, flashings, wall insulation, and exterior sheathing material, felt, vapor barrier and architectural precast concrete sections specified.
  - 1. Schedule mock-up panel sufficiently in advance of scheduled beginning of masonry operations to allow time for mortar to cure and cleaning to be completed before

- observation by Architect, and for additional mockups to be completed should initial mockup be rejected.
2. Build sample panels until panel is approved for quality or work by the Architect of Record.
  3. Locate where directed by Architect but as a minimum panel to have a southern exposure / exposed to sun.
  4. Mock-up may remain as part of the work if agreed upon by Architect.
  5. See "Quality Control Submittals" below for sample panel size.

### **1.7 PRE-INSTALLATION MEETING**

- A. Convene one week before starting work of this section.
  1. Review field conditions with Contractor and confirm that work of other trades is correctly prepared for masonry to begin.
  2. Review layout of control joints with Architect.
  3. Select location of mock-up panels.

### **1.8 QUALITY CONTROL SUBMITTALS:**

- A. Test Reports – material test reports from qualified independent testing laboratory indication and interpreting test results relative to compliance of following items with specified requirements:
  1. Masonry unit tests
- B. Mortar Mix: Submit data for each "Type" of mortar specified, indicate compliance with the "proportions" requirements of ASTM C270.
  1. Included description of type and proportions of all ingredients in mortar. Include certification from the manufacturer / supplier of each material / ingredient in mortar, indicate compliance with the "proportions" requirements.
- C. Grout Mix: Submit data for grout type specified, indication compliance with the "strength requirements" of ASTM C476.
  1. Include description of type and proportions of all ingredients in grout. Include certification from the manufacturer / supplier of each material ingredient in grout, indicating compliance with the material requirements specified in products.
- D. Certificates – Signed by manufacturer and Contractor certifying that each of following materials complies with specified requirements:
  1. Each different concrete masonry unit specified.
- E. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.
  1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
  2. Architectural Concrete Masonry Unit Test: ASTM C90 and the finished surface shall match existing product.
- F. Fire – Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and

inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

- G. Sample Panels: Build sample or mock-up panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Construct sample panels in accordance with requirements of Mock-up Panel herein.
1. Build sample panels for each type of new masonry construction in minimum sizes approximately 48 inches high by 72 inches long.
    - a. Provide sample panel for each type of new masonry specified.
  2. Sample Panel to include, but not be limited to the following: New masonry types, back up wythe CMU, mortar, grout filling for reinforced CMU cells, insulation, vapor barrier, sill members, window system, and glass units, control and expansion prior to beginning masonry construction. Do not start masonry construction until Architect has reviewed and accepted sample panel.
  3. After Architect's review and acceptance, panel establishes standard of comparison for all masonry construction. Protect panel from damage during masonry construction. Do not destroy or remove panel until directed by Architect.
- H. Pre-Installation Conference.
1. Conduct "Masonry Pre-Installation Conference" not less than 7 days and not more than 21 days prior to scheduled start of masonry construction. Complete construction of Mock-up Panels specified above prior to the Pre-Installation Conference.
  2. Include representatives of following organizations:
    - a. General Contractor
    - b. Field Representatives of Masonry Sub-contractor (where applicable), including foreman and
    - c. Superintendents who will be assigned to the Project
    - d. Owners representative
    - e. Owners testing agency
    - f. Project Representative
    - g. Architect
  3. Minimum Agenda:
    - a. Review all masonry systems, materials, procedures, installation techniques, and sequences to be used in masonry construction, including (but not limited to) the following:
      - 1) Materials and accessories
      - 2) Quality assurance, inspection and testing requirements
      - 3) Project/site conditions and protection of masonry construction
      - 4) Workmanship including control joints, masonry anchoring and grout placement
      - 5) Cleaning of completed masonry
      - 6) Cold weather and hot weather masonry construction
    - b. Coordinate rough in box locations prior to executing the work to ensure placement of devices are coordinated with adjacent work including doors, joint systems, and



sheet metal copings and flashing systems. Refer to other sections which have materials to be built into mockup panels.

- 1) Provide sample panel for Architectural Masonry work.
  - 2) Provide sample panel for regular and fire rated concrete masonry units.
4. Construct panel and obtain Architect's review and acceptance of sample panels before ordering masonry products, prior to Pre-Installation Conference.
  5. Review and coordinate adjacent construction requirements, including identifying items specified elsewhere for installation in masonry construction.

### **1.9 PROJECT CONDITIONS**

- A. 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.
- B. Hot-Weather Requirements: Comply with requirements of the IMIAWC (HW).

### **1.10 SEQUENCING AND SCHEDULING**

- A. Load Application: Refer to Structural Engineer to verify when loading of new masonry can occur.
  1. Do not apply uniform floor or roof loading for at least 12 hours after completing construction of masonry columns or walls.
  2. Do not apply concentrated loads for at least 3 days after completing construction of masonry columns or walls.
  3. Rubber Flute Closures for Steel Roof Deck: Coordinate with Steel Roof Deck Installer to obtain rubber flute closures for installation during construction of masonry walls. Provide written receipt to Steel Roof Deck Installer upon delivery of rubber flute closures.

### **1.11 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver masonry materials to project in undamaged condition.
  1. Pre-Blended Mortar: Deliver pre-blended mortar in reusable packages, marked with manufacturer's name and mortar type.
  2. Deliver, handle, and store masonry units by means that will prevent damage and contamination by other materials.
    - a. Schedule delivery of masonry materials sufficiently in advance of use to allow time for drying, tempering and protection.
- B. Storage and Protection:
  1. Store masonry construction materials off ground, under cover, and in dry location to prevent deterioration or damage due to moisture, temperature changes, contaminants,

- corrosion, and other causes, if units become wet, do not place until units are in air-dried condition.
2. Store cementitious materials off ground, undercover, and in dry location.
  3. Store aggregates where level grading and other required characteristics can be maintained.
  4. Masonry units shall be delivered to the jobsite on banded pallets with individual protective covers on each glazed block face. Keep protective block covers on the blocks until installation. Store pallets in single stacks on level ground and cover with waterproof covering (e.g., tarpaulins) to protect the blocks from inclement weather. Handle blocks carefully to avoid breakage and damage to the finished surface.
  5. Store pre-blended mortar in reusable packages in which delivered and in protected locations to prevent deterioration or intrusion of foreign materials.
  6. Cover materials, including reinforcement, when necessary to protect from elements.
  7. Do not use calcium-chloride or de-icing salts to remove ice from masonry surfaces.

## **PART 2 - PRODUCTS:**

### **2.1 MANUFACTURERS**

- A. As a basis of design products have been specified by manufacturer's noted below.
  - 1. Products: Provide products specified or of equivalent style and properties for Architect's review. Products must comply with specified requirements.
- B. Colors, textures and patterns for Exposed Masonry Units: As selected by Architect from manufacturer's full range of textures and colors.

### **2.2 CONCRETE MASONRY UNITS (CMUs)**

- A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bond beam shapes, bonding, cove base, angled corners, bullnose shapes, and other special conditions.
- B. Concrete Masonry Units: ASTM C 90.
  - 1. Load-Bearing Units: ASTM C 90.
    - a. Both hollow and solid block, as indicated.
    - b. Exposed faces: Manufacturer's standard color and texture.
  - 2. Provide special shapes where indicated and as follows:
    - a. For lintels, corners, jambs, sash, control joints, headers, bonding, cove base, angled corners, bond beam, and other special conditions.
    - b. Provide factory formed bull nose CMU for all outside corners, except where otherwise noted.
    - c. Open-end units for use in walls of reinforced unit masonry.
- C. CMU NOT EXPOSED TO EXTERIOR / ABOVE GRADE / BACK UP WALLS:
  - 1. Hollow Units: Two-cell concrete masonry units consisting of Portland cement, water, and mineral aggregate, complying with requirements of ASTM C90 for type specified.
    - a. Medium Weight Hollow Units: Dry Weight 105 to 124.9 lbs / cu.ft.
    - b. Aggregate: Expanded clay, shale or slate: or expanded slag or pumice complying with requirements of ASTM C331 and C33 aggregates.
    - c. Size: Manufacturer's standard units with nominal face dimensions of 16"long x 8" high x thickness indicated on drawings. Provide sizes required to achieve configurations and applications noted.
    - d. CMU Unit Types: Fine texture face suitable for painting.
  - 2. Where Required to Maintain Continuity and Ratings provide Solid Units: Concrete masonry units greater than 75 percent solid consisting of Portland cement, water, and mineral aggregate, complying with requirements of ASTM C90 for type specified.

- a. Medium Weight Solid Units – Suitable for Fire- Rated Construction: Dry Weight 105 to 124.9 lbs / cu. ft.
- b. CMU Equivalent Thickness: Provide at least 100 percent solid unit for 4-inch thick CMU.
- c. Aggregate: Expand clay, shale or slate; or expanded slag or pumice complying with requirements of ASTM C331.
- d. Size: Manufacturer’s standard units with nominal face dimensions of 16” long x 8” high x thickness indicated on drawings. Provide sizes required to achieve configurations and applications noted.
- e. CMU Unit Types: Fine texture face suitable for painting.

**D. CMU BELOW GRADE:**

1. Hollow Units: Two-cell concrete masonry units consisting of Portland cement, water, and mineral aggregate, complying with requirements of ASTM C90 for type specified.
  - a. Normal Weight Hollow Units: Weighing 125 lbs /cu.ft. or greater.
  - b. Aggregate: Complying with requirements of ASTM C33 aggregates.
  - c. Size: Manufacturer’s standard units with nominal face dimensions of 16”long x 8” high x thickness indicated on drawings. Provide sizes required to achieve configurations and applications noted.

- E. Provide CMU shapes and sizes to achieve configurations noted on drawings.
- F. Provide factory formed bullnose edges on all exterior corners of interior CMU units unless otherwise noted.
- G. Masonry Bond Beams: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.
- H. Provide continuity at wall intersections by using prefabricated T-shaped units.
- I. Provide continuity at corners by using prefabricated L-shaped units.

**2.3 ARCHITECTURAL MASONRY**

**A. Product Name:**

1. General: As a basis of design, all architectural masonry units shall “MATCH EXISTING ARCHITECTURAL CMU UNITS IN PLACE” or approved equal.
  - a. Acceptable manufacturers that may comply with the specified requirements upon submission and review for compliance include, but are not limited to the following:
    - 1) Nitterhouse Masonry products, 859 Cleveland Ave, Chambersburg, PA 17201
      - a) NM-Shade 161 Split Face to match existing as selected by Architect from full range of options
      - b) or approved equal.
      - c) Product representative: Diener Brick Company; Cuthbert & Park Ave., Collingswood NJ 08108; ph: 856-858-2000

B. Product Description:

1. Concrete blocks for grinding shall conform to ASTM C90 and be processed and manufactured within 500 miles of the project site for regional materials and resources.
2. Materials conform to Indoor Environmental Quality requirements; and be manufactured with low emitting materials with VOC levels conforming with the NJ State requirements.
3. All units shall contain a manufacturer-approved integral water-repellent CMU admixture at the time of manufacture.
4. Sizes and Shapes: Surfaces are manufactured to provide finished dimensions of 7-5/8" x 15-5/8" ± 1/8".
  - a. Nominal 2", 4", 6", 8", 10" and 12" standard block shapes.
  - b. Provide high-strength units for special structural requirements, over-sized units, and unit sizes required to make the project complete.
  - c. Basic units may include stretchers, jambs, caps, bond beams, and cove bases.
  - d. Semi-solid and solid units shall be used where specified; as shown on the drawings; or required to make the installation complete.

C. Finish Selections / Masonry Types: As selected by Architect from the full range of colors and textures.

1. Provide CMU shapes and sizes to achieve configurations noted on drawings or required to make the installation complete; including stretchers, open ended units and bond beams, and jamb units.
2. Provide caps, small shape series, and units as noted on drawings or required to make installation complete.
3. Masonry Bond Beams: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.
4. Provide continuity at wall intersections by using prefabricated T-shaped units, angle units and corner units where possible and available.
5. Install in accordance with manufacturers installation instructions and guidelines.

## 2.4 BRICK

A. Product Name:

1. General: As a basis of design, all brick units shall "MATCH EXISTING UNITS IN PLACE" or approved equal.
  - a. Acceptable manufacturers that may comply with the specified requirements upon submission and review for compliance include, but are not limited to the following:
    - 1) US Brick;- Shade Cherry Red,
    - 2) Palmetto Brick – Medium Red Wirecut,
    - 3) Taylor – 317 Wirecut DBC Series,
    - 4) or approved equal.
    - 5) Brick to match existing as selected by Architect from full range of options.
    - 6) Product representative: Diener Brick Company; Cuthbert & Park Ave., Collingswood NJ 08108; ph: 856-858-2000

## **2.5 CAST STONE**

- A. Product Name:
1. General: As a basis of design, all cast stone units shall “MATCH EXISTING UNITS IN PLACE” or as defined by the contract documents.
    - a. Acceptable manufacturers that may comply with the specified requirements upon submission and review for compliance include, but are not limited to the following:
      - 1) Rockcast, Cast Stone, by Reading Rock, Inc. 4600 Devitt Drive, Cincinnati, Ohio 45246
      - 2) Shouldice; 281227 Shouldice Block Road; Shallow Lake, Ontario
      - 3) or approved equal.
      - 4) Cast Stone to match existing as selected by Architect from full range of options.
      - 5) Product representative: Diener Brick Company; Cuthbert & Park Ave., Collingswood NJ 08108; ph: 856-858-2000

## **2.6 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- B. Hydrated Lime: ASTM C 207 - “Type S”.
- C. Colored Cement Product: Packaged blend made from portland cement and lime, and mortar pigments, all complying with specified requirements, and containing no other ingredients comply with ACI 530.1. Masonry cements not allowed.
1. Formulate blend as required to match color as selected by Architect from manufacturer’s full range of colors to “MATCH EXISTING”.
    - a. Products: Colored Portland Cement-Lime Mix
      - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Essroc; Flamingo-Brixment Colored Portland Cement and Hydrated Lime Blend
      - 3) Lafarge North America Inc.; Eaglebond.
      - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
- D. Aggregate for Mortar: ASTM C 144.
1. For joints less than ¼-inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.

- F. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494 / C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products:
    - a. Great Eastern Technologies, LLC; Chemstrong CF.
    - b. Euclid Chemical Company (The); Accelguard 80.
    - c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
    - d. Sonneborn, Div. of ChemRex; Trimix-NCA.
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
1. Products:
    - a. Great Eastern Technologies, LLC; Chemstrong Aquashield Water-Repellent Admixture for Mortar
    - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
    - c. Master, Inc.; Rheomix Rheopel.
    - d. "Integral Waterpeller" by the Euclid Chemical Company
- H. Water: Potable, clean and free of deleterious amounts of acids, alkalis or organic materials.
- I. Grout: Comply with requirements of ASTM C476 for fine grout for all grout used in Project. Installed in accordance with ACI-531. With a minimum 28-day compressive strength of 2,500 psi.
- J. Mortar: Refer to mortar selections noted below for new conditions.

## **2.7 REINFORCEMENT**

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A 615M, Grade 60.
- B. Reinforcement and metal accessories:
1. All reinforcing steel to comply with ASTM A951.
  2. Modify the reinforcing accessories as required to suite the field conditions encountered as directed by the Architect / Engineer of record.
  3. Corrosion Resistant Requirements for all Interior and Exterior reinforcing accessories:
    - a. Provide all joint reinforcement, ties, and anchors with hot-dip galvanized coating with 1.5 oz. per square foot, as per ASTM A153, Class B2.
  4. Two wythe cavity walls - anchors and ties: Comply with requirements of ACE 530.1 and as noted in this article.
    - a. Adjustable Reinforcement System: Truss Type reinforcing by Hohmann and Barnard, Inc.; allowing vertical and horizontal movement of masonry wythes while

- b. restraining tension and compression with 9 ga wire, welded loops, and 3/16" Box Byna-Tie similar to:
  - 1) "180 S.I.S. Dub'l Loop-Lok Truss with SeismiClip Interlock System
    - a) Provide Loop-Lok Washer to hold insulation in place;
    - b) Provide optional 2.25" vertical adjustability;
    - c) Provide 9 ga Continuous Wire and SeismiClip.
    - d) Adjust to block size / conform to wall thickness and conditions noted on drawings.
  - 2) Other Manufacturer's include:
    - a) DUR-O-WAL Inc.
    - b) Heckmann Building Products, Inc.
    - c) Or approved equal.
5. Back up cavity walls to beams and columns: Steel Beam Anchors: 3/16-inch diameter triangular wire tie that will allow differential horizontal movement; similar to:
  - a. "#359 Weld-On- Tie 1/4" diameter" with "3/16" V-Byna-Tie
    - 1) Provide SeismiClip Interlock System with Continuous 9 ga wire" at ties to cavity.
  - b. #363-BT Flexible Gripstay Anchor fitted with a V-Byna-Tie with #360 Gripstay Channel.
    - 1) Provide Seismiclip Interlock System with Continuous 9 ga wire" at ties to cavity.
    - 2) Mechanically fasten to steel column or beams with approved fasteners for application.
  - c. Other Manufacturer's include:
    - 1) DUR-O-WAL Inc.
    - 2) Heckmann Building Products, Inc.
    - 3) Or approved equal.
6. Exterior back up walls constructed of metal framing and sheathing or poured concrete walls to exterior wythe: Steel Beam Anchors: 3/16-inch diameter triangular wire tie that will allow differential horizontal movement; similar to:
  - a. "X-Seal / 3/16" Byna-Lok Seismic Anchor and Tie with Continuous 9 ga wire" by Hohmann and Barnard, Inc.;
    - 1) Adjust leg depth for application and substrate requirements.
    - 2) Adjust Byna-Lok length for application and substrate requirements.
    - 3) Provide X-seal tape.
  - b. Other Manufacturer's include:
    - 1) DUR-O-WAL Inc.
    - 2) Heckmann Building Products, Inc.
    - 3) Or approved equal.



7. Veneer joint reinforcement and clips: Continuous Single 9 gauge, wire joint reinforcement embedded in masonry veneer. Wire to comply with ASTM A82. Attach wire to veneer tie with seismic clip, similar to:
  - a. "SeismiClip" by Hohmann and Barnard, Inc.
  - b. Other Manufacturer's include:
    - 1) DUR-O-WAL Inc.
    - 2) Heckmann Building Products, Inc.
    - 3) Or approved equal.
  
8. Reinforcing bar positioners: 9-gauge corrosion-resistant steel bar positioners accommodating position of vertical reinforcing bars as shown on drawings; similar to:
  - a. "RB & RB-Twin Positioners" by Hohmann and Barnard, Inc.
    - 1) Adjust size to wall thickness.
    - 2) Bar Positioner: by DUR-O-WAL, Inc.
  
  - b. Other Manufacturer's include:
    - 1) DUR-O-WAL Inc.
    - 2) Heckmann Building Products, Inc.
    - 3) Or approved equal.
  
- C. Embedded Flashing Materials
  1. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with DIVISION 7 Section "Sheet Metal Flashing and Trim."
  2. Metal Drip Edges / Plate: Fabricate from stainless steel ASTM A666 Type 304, No. 4 finish s.s. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed similar to Hohmann and Barnard "DP-FTSA with self-adhesive strip" or approved equal.
  3. Flexible Flashing: For flashing not exposed to the exterior, coordinate flexible flashing product with manufacturer of spray applied vapor barrier system specified in Division 07. System components to be from a sole source where possible. If manufacturer of spray applied system cannot provide a thru wall flashing system utilize the following, unless otherwise indicated. Confirm product selection is compatible with the spray applied vapor barrier system:
    - a. Cloaked Flashing Membrane System; similar to Hyload cloaked flashing system or approved equal. Ensure membrane flashing system is compatible with the spray applied product being proposed as a vapor barrier.
    - b. Provide supporting documentation to support compatibility of products for each manufacturer proposed.

- 1) Standard Type, Elastomeric and thermal plastic polymers combined with Dupont Elvaloy reinforced with synthetic fibers and calendered into 40-mil sheets with the following properties:
  - a) Elongation: 175% per ASTM D412
  - b) Tensile Strength: 650 psi per ASTM D412
  - c) Low Temperature Flexibility: -25 degree F - Pass ASTM D146
  - d) Water Absorption: Less than .1% per ASTM D471
  - e) Color as selected by Architect from Manufacturer's full range of colors.
  - f) Compatible with Urethane and Silicone sealant.
  - g) UV Stable
  
- 2) Shapes and Sizes: Standard or customized three-dimensional shapes (Cloaks) as required for project conditions to form a complete flashing system with preformed corners, end dams, other special shapes, and seaming materials; all provided by flashing sheet manufacturer.
  - a) Fully adhered membrane, minimum size 24" for thru wall applications.
  - b) Accessory Materials: As recommended by the manufacturer for project conditions including termination bar system at vertical wall, flashing membrane adhesive, mastic, primer, and sealant.
  - c) Flashing manufacturer's standard adhesive, primer and mastic products for bonding flashing sheets to each other, to cloaks and to substrates. A 4" minimum overlap is required.
  - d) Shop drawings: Provide a shop drawing of the flashing design for the project and location of cloaks on reduced floor plans from the product manufacturer.

**D. MISCELLANEOUS MASONRY ACCESSORIES**

1. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.
2. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and providing Durometer hardness of 80 when tested in accordance with ASTM D 2240; similar to:
  - a. "Rapid Control Joint – Rubber compound" by DUR-O-WAL Inc,
  - b. "Control Joint 2900/2901/2902/2903/2905" by Wire-Bond
  - c. "RS-Standard – Rubber Control Joint" by Hohmann and Barnard, Inc.
3. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt) or VOC-compliant form release agent suitable for brush or roller application; similar to "Eucoslip VOX" by Euclid Chemical Co.
4. Non-metallic expansion Joint Strips: Pre-molded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade 2A1, capable of compression up to 35 percent, of width and thickness required for joint; similar to:
  - a. Rapid Soft-Joint/Expansion Joint" by DUR-O-WAL Inc.
  - b. "Horizontal Expansion Joint" by Wire-Bond

- c. "NS Closed-Cell Neoprene Sponge" by Hohmann and Barnard, Inc.
5. Grout Screen" Monofilament, non-corrosive screen designed to isolate flow of grout in designated areas while maintaining positive bond in mortar; similar to "Dur-O-Stop" by DUR-O-WAL, Inc. or "MGS" mortar grout screen by Hohmann and Barnard, Inc.
6. Weep/Vent Products: Use the following, unless otherwise indicated:
  - a. Rectangular Plastic Weep / Vent: "QV" Quadro-Vent's honeycomb design to release moisture and restrict ingress of insects and other debris.
    - 1) Polypropylene tested in conformance with ASTM D2240, D790B, D638 and D1238B.
    - 2) Can be used for top of wall venting.
    - 3) Finishes: Black, Grey, Clear, Almond, Buff, Cocoa, or White as selected by Architect.
    - 4) Size: 3/8" x 3 3/8" x 3 1/2" Jumbo size, or as selected by Architect from standard and custom options.
    - 5) Or approved equal.
7. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  - a. Strips, full-depth of cavity (1 and 2" thickness) and 10 inches high minimum, with 90% open weave mesh in dovetail shaped notches. Fill cavity air space and provide continuous bottom strip designed to keep weep hole vents open and flashing free of mortar droppings. System is designed to permanently suspending droppings and debris above the top of the weep holes vents to promote free air movement in the cavity and prevent clogged with mortar. Provide Sheets or strips full depth of cavity and installed in accordance with manufacturer's guidelines and instructions.
  - b. Products similar to Mortar Net USA, Ltd.; Mortar Net Drainage Systems or approved equal.

#### E. INSULATION

1. Cavity Wall Insulation: Extruded-Polystyrene Board Insulation: ASTM C 578, Type X for cavity wall insulation, closed-cell product extruded with an integral skin. Refer to DIVISION 7 "Thermal insulation".
  - a. Utilize Mastic installation with taped seams at all panel joints.

#### F. MASONRY CLEANERS

1. CMU Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use

product approved for intended use by manufacturer of masonry units being cleaned. Acid cleaners are not acceptable.

- a. Products:
  - 1) Diedrich Technologies, Inc.
  - 2) EaCo Chem, Inc.
  - 3) ProSoCo, Inc.
  
- b. Architectural Masonry Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by manufacturer for exterior architectural masonry units / cmu surfaces.
  - 1) Utilize "Light Duty Concrete Cleaner" by ProSoCo, Inc. or approved equal.
  - 2) Follow dilution rate suggested by manufacturer.
  - 3) Acid cleaners are not acceptable.
  - 4) Do not powerwash surfaces.
  - 5) Clean areas of new work.
  - 6) Clean existing walls where shown on drawings. Cleaning to run to top of masonry band (Architectural Spilt Face Grade to top course of split face wall), limits to extend as shown on drawings, or if not shown from outside corner to outside corner on the building elevation.

#### G. MORTAR AND GROUT MIXES

1. General: Do not use admixtures, unless otherwise indicated.
  - a. Do not use calcium chloride in mortar or grout.
  - b. Limit cementitious materials in mortar for exterior masonry to portland cement and lime.
  - c. 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.
2. Mortar for Unit Masonry (Grey and Architectural units): Comply with ASTM C 270
  - a. For masonry below grade or in contact with earth, use "Type M".
  - b. For CMU Bearing Wall and Reinforced Masonry above grade, use "Type S or M".
  - c. For exterior, above-grade, load-bearing and non-load-bearing walls use "Type S".
  - d. For interior non-load-bearing partitions, "Type N".
  - e. For New Exterior Masonry (Veneer) above grade Veneer: "Type N".
3. Mortar Add-mixture: Add integral water repellent to mortar for exterior exposed walls, below grade applications, walls in contact with the earth and parapet walls.
4. Re-temper mortar only within two hours of mixing.
5. Grout for Unit Masonry: Comply with ASTM C 476. Low lift Method only.
  - a. Use grout: 2500 PSI (Type M) comply with Building Code Requirements for dimensions of grout spaces and pour height.
  - b. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which masonry is to be installed in coordination with Installer of materials and components specified in this Section and notify the General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from

applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

### **3.2 PREPARATION AND PROTECTION**

- A. Cooperation: Check relationship of masonry to work under other sections, cooperate with others and proceed as desirable for general progress and best interest of project.
  - 1. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Cover walls each day after installation to keep open walls protected and dry. After units are installed, they should be protected from damage by other trades performing operations that can stain or otherwise damage the finished surfaces by covering walls with plastic. Corners should be protected from damage after installation by covering them with plywood.
- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- D. Wall Covering: During erection, cover top of walls, projections, and sills with strong waterproof membrane at end of each day or shutdown. Cover partially completed walls when masonry construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold securely in place.
  - 2. Where one wythe of multi-wythe walls is completed in advance of other wythes, secure cover minimum 24 inches down face next to un-constructed wythe and hold cover in place securely.
- E. Staining: Prevent grout or mortar from staining face of masonry to be left exposed or painted. Immediately remove grout or mortar in contact with face of masonry.
  - 1. Protect all sill, ledges and projections from droppings of mortar.
  - 2. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

### **3.3 INSTALLATION, GENERAL**

- A. Lighting: Provide adequate lighting for masonry work by placing all lighting at a reasonable distance from the wall for even illumination.
- B. Establish lines, levels, and coursing indicated. Protect from displacement.
- C. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
  - 1. Adjust masonry dimensions and install starter units as required to eliminate small cuts and to maintain bond. Cut neatly around contacting work. Bonding patterns to match existing.
  - 2. Masonry dimensions for exterior openings are nominal. Lay out masonry openings to provide ¼-inch maximum sealant joint at metal frames.
- D. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, un-chipped 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. Provide drilled or saw cut holes in masonry walls for the passage of new mechanical work. Seal all voids with approved material to maintain fire rating, prevent air movement, or eliminate travel of sound.

- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- F. Wet masonry units if in accordance with manufacturer's installation guidelines and before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying units.
- G. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
  - 1. 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 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 maximum.

#### H. LAYING MASONRY WALLS

- 1. 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.
- 2. Bond Pattern for Exposed Masonry: Match Existing.
  - a. Grey and Architectural Masonry Units: Unless otherwise indicated, or approved by Architect in mock-up panel, lay exposed masonry in bond pattern to match existing; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - b. Bond Pattern for Concealed Masonry: Lay with all units in 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 dimension at corners and jambs.
- 1. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- 2. Rubber Flute Closures for Steel Roof Deck: Install rubber flute closures received from Steel Roof Deck Installer to fill flute between roof deck and supporting beams at all building exterior walls.
- 3. Fill space between hollow metal steel door frames and masonry solid with mortar, unless otherwise indicated.
- 4. Fill cores solid at all hardened locations with rebar at 12" on center. Refer to drawings for locations.
- 5. Fill cores solid where noted on structural drawings for reinforcement.
- 6. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- 7. Architectural Masonry: Draw blocks from more than one pallet at a time during installation. All exterior mortar shall include manufacturer-approved matching water-

repellent additive added to each batch in the appropriate dosage rates for mortar type specified in accordance with the manufacturer's instructions.

- a. Refer to NCMA TEK Notes, for Hot and Cold weather construction practices.
- b. Lay units using the best concrete masonry practices. Install only quality units; reject all defective units as defined by ASTM C90.
- c. Lay architectural blocks with the faces level, plumb and true to the line strung horizontally at the ground or filled and polished face.
- d. Units shall have uniform, 3/8"-wide joints both horizontally and vertically on the finished side of the wall. Tool joints neatly after they are finger-hard to make them straight and uniform.
- e. Size and place cut pieces appropriately to maintain consistency and bond. Complete masonry construction using procedures and workmanship consistent with the best masonry practices.

#### I. MORTAR BEDDING AND JOINTING

1. Lay concrete masonry units as follows:
2. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - a. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  - b. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  - c. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
3. Lay solid masonry units with completely filled bed and head joints; and shove into place. Buttering corner of joints or excess furrowing of mortar joints is not permitted.
4. Tool exposed joints slightly concave or as selected and approved by Architect in mockup panel. Tool joints when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
5. Cut joints flush for masonry walls to receive wall tile, resilient base or other direct-applied finishes (other than paint), unless otherwise indicated.
6. Remove excess mortar as work progresses.
7. Bonding: Interlock intersections and external corners.
8. Fitting:
  - a. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
  - b. Perform job site cutting of masonry units with masonry saw and proper tools to provide straight, clean, un-chipped edges. Do not use broken masonry units with damaged corners or edges.
9. Isolation from Structural Elements:
  - a. Isolate masonry partitions from vertical structural framing members with a control joint.
  - b. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.



10. Architectural Masonry:

- a. Lay units with full mortar coverage on head and bed joints taking care not to block cores to be grouted or filled with masonry insulation.
- b. Tool all mortar joints when thumbprint hard into a concave configuration.
- c. Care should be taken to remove mortar from the face of masonry units before it sets.
- d. Tuckpoint the joints of scored units for proper appearance. All exterior scored units must be tuckpointed to prevent water penetration. No rake joints.

J. CAVITY WALLS

1. Bond wythes of cavity walls together using the following:

- a. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 16 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 16 inches o.c. vertically.
  - b. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
  - c. Use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align. Utilize seismic clip and continuous wire at each veneer tie and install per the manufacturer's recommendations.
  - d. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
2. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
  3. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards. Fit insulation between wall ties and other confining obstructions, with edges butted tightly. Press units firmly against inside wythe of masonry and comply with manufacturer's installation instructions for installation of insulation in cavity wall.
  4. Construct interior or back up wythe full height of story to underside of solid floor or roof deck above and install pressure-relieving compressible joint filler in joint between top of

wythe and underside of deck above. Prior to installing outer wythe of masonry veneer apply vapor barrier to surface of CMU backup wythe.

#### K. JOINTS IN MASONRY CONSTRUCTION

1. Provide vertical and horizontal expansion, control, and isolation joints in masonry where shown and as specified below; install related items such as metal expansion joint covers as masonry construction progresses.
  - a. Space joints as shown on Drawings; however, not more 20 feet for control joints in concrete block walls.
  - b. Do not form continuous span through movement joints.
  - c. Fill joint in fire-rated walls with joint filler materials suitable to maintain required fire rating of wall.
2. Control Joints in Concrete Masonry:
  - a. Unless otherwise specified, install performed control joint gaskets designed to fit standard sash blocks.
  - b. Provide control joints at all steel column locations.
  - c. Install compressible joint filler, backer rod, and sealant in accordance with DIVISION 7.
  - d. Construct horizontal pressure relieving joints where shown on drawing. Insert compressible joint filler, backer rod, and sealant below lintel in accordance with DIVISION 7.
  - e. Rake horizontal and vertical joints at sills and copings to  $\frac{3}{4}$  inch depth to receive, backer rod and sealant installed as part of the work of DIVISION 7 – Joint Sealers.

#### L. MASONRY JOINT REINFORCEMENT

1. General: Install in mortar with a minimum cover of  $\frac{5}{8}$  inch on exterior side of walls,  $\frac{1}{2}$  inch elsewhere. Lap reinforcement a minimum of 6 inches. Install 16 inches on center vertically.
2. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
3. Provide continuity at wall intersections by using prefabricated T-shaped units.
4. Provide continuity at corners by using prefabricated L-shaped units.
5. Horizontal Joint Reinforcement: Install 16 inches on center.
  - a. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
  - b. Place continuous joint reinforcement in first and second joint below top of walls.
  - c. Lap joint reinforcement ends minimum 6 inches.
  - d. Use prefabricated corners and tees.

#### M. ANCHORING MASONRY TO STRUCTURAL MEMBERS

1. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

- a. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated.
- b. Anchor masonry to structural members with dovetail slots and dove tail anchors at 16 inches on center both ways; embedded in masonry joints and attached to structure.
- c. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally.

**N. ANCHORING MASONRY VENEERS**

1. Anchor masonry veneers to concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
  - a. Fasten seismic anchors to concrete and masonry backup with metal fasteners of type indicated or recommended by manufacturer. Use a minimum of two fasteners.
  - b. Embed tie sections in masonry joints. Provide not less than 1" inch (min) of air space between back of masonry veneer and face of insulation.
  - c. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - d. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 16 inches around perimeter.

**O. FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS**

1. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated Install flashing as follows, unless otherwise indicated:
  - a. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
  - b. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing a minimum 4 inches at ends and turn up not less than 2 inches to form end dams.
  - c. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge. Install flexible flashing against CMU to run a

minimum of 6 inches above mortar drainage net within cavity as recommended by the manufacturer.

2. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  - a. Use specified weep/vent products to form weep holes.
    - 1) Space weep holes a minimum of 24 inches o.c. horizontally, unless otherwise indicated.
3. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material Specified in Part 2.

**P. REINFORCED UNIT MASONRY INSTALLATION**

1. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - a. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
2. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
  - a. Where vertical reinforcing for CMU walls is indicated in the Drawings, install deformed bars specified in Division 03 as indicated in the Drawings. Where indicated, bars shall be installed vertically in grouted cells and horizontally in grouted bond beams. Where not otherwise indicated, provide 1-#5 vertical each side of each opening with a 2-foot minimum extension past sill and head, and 1-#5 vertical full height at all unsupported wall edges. Also provide 2-#5 horizontals at the top and bottom of all walls, and at the tops and bottoms of wall openings.

Provide lapped splices consistent with construction methods and acceptable to the Structural Engineer.

3. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Use low lift grouting method.
  - a. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - b. Limit height of vertical grout pours to not more than 48 inches.
  - c. Provide solid grouting of 2-wythe reinforced masonry walls to fill collar joints solid.

### **3.4 LINTELS**

- A. Install loose steel lintels over openings. Refer to drawings.
- B. Maintain minimum 6-inch bearing on each side of opening.

### **3.5 GROUTED COMPONENTS**

- A. General: Reinforce masonry unit cores or cavities with deformed steel reinforcing bars and grout as indicated.
- B. Layout: Build reinforced hollow unit masonry to preserve unobstructed vertical continuity of cells to be filled.
- C. Reinforcement:
  1. Lap splices minimum 36 bar diameters.
  2. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Grouting:
  1. Place and consolidate grout fill without displacing reinforcing.
  2. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.
  3. Grout spaces less than two inches in width with fine grout using low lift grouting techniques. In spaces greater than two inches use coarse grout using high or low lift grouting techniques.
  4. Hold mortar in bed joints back 1/4 inch from edges of masonry unit adjacent to grout spaces, bevel back and upward from grout space. Keep mortar droppings out of grout spaces. Head and bed joints shall be shoved at least 1/2 inch into place.
  5. When the grouting is stopped for one hour or longer, stop placing of grout minimum of one inch below top of uppermost unit.
  6. Low Lift Grouting: Limit height of pours to 12 inches. Immediately puddle grout spaces with stick or rod (not trowel) sufficiently to cause grout to flow into spaces between masonry units.

### **3.6 CONTROL JOINTS**

- A. Install control joints where indicated on Drawings and in following locations:
  1. Continuous vertical joints that are not toothed.
  2. Horizontal joints between non-bearing masonry and structural deck above.

3. Concrete Masonry: As recommended by NCMA TEK 10-2A.
  4. Brick Masonry: As recommended by BIA Technical Note 18A.
- B. Do not continue horizontal joint reinforcement through control and expansion joints.
- C. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- E. Size control joint in accordance with Division 07 for sealant performance.

### **3.7 BUILT-IN WORK**

- A. As work progresses, install built-in architectural pre-cast concrete, metal door frames, glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
1. Install sleeves of proper size provided by others, where directed, to permit passage of pipes through walls. Build-in wall sleeves, anchors, plates, and other members provided by others. Properly set built-in items as walls progress and under direction of party providing built-in items.
  2. Install built-in items plumb, level, and true to line.
  3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout as wall is built.
    - a. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
    - b. Do not build into masonry construction organic materials that are subject to deterioration.
  4. Access Panels: Install access panels occurring in masonry walls.
    - a. Access Panels: Furnished under other sections. See Division 08.
    - b. Accurately locate as directed.
  5. Cavity Wall Insulation: Install with adhesive as recommended by manufacturer.
    - a. Provide small pads of adhesive spaced approximately 12 inches OC both ways on inside face.
    - b. Fit boards of insulation between joint reinforcement and other confining obstructions in cavity. Tightly butt edges both ways. Press units firmly against inside wythe of masonry.
    - c. Wedge insulation from outside wythe with small fragments of masonry spaced 24 inches OC both ways.
    - d. Tape all joints between insulation panels.
  6. Embedded Sheet Metal: Install embedded sheet metal flashing, reglets, etc., provided by others. Clean surfaces of masonry smooth and free from projections which might

puncture or otherwise damage embedded materials. Place embedded items on bed of fresh mortar. Cover with fresh mortar before laying succeeding courses.

7. Chases and Recesses: Provide chases in masonry walls as indicated and required for mechanical and electrical work for pipes and conduits. Build recesses as required for accommodation of cases and cabinets, radiators, and unit heaters. Install lintels for recesses over 16 inches in width.

### **3.8 TOLERANCES**

A. Comply with following tolerances:

1. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
2. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
3. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
4. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
5. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

B. Masonry Stone Veneer:

1. In accordance with ACI 530.1 ASCE6 / TMS602.
2. Maximum Variation of Joint Thickness: Plus minus 1/8 inch.
3. Maximum Offset From Adjacent Unit: 1/8 inch.

### **3.9 CUTTING AND FITTING**

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Make all unit cuts, including those for bonding, holes, boxes, etc., with motor-driven masonry saws, using either an abrasive or diamond blade. Cut neatly and locate for best appearance.
- C. Coordinate rough in box locations with Architect and Engineer prior to executing the work to ensure placement of devices is coordinated with adjacent work including doors, openings, windows, casework, and equipment.

1. Where cutting of units is necessary, make cuts with experienced mechanics in workmanlike manner, using motor-driven masonry saw.
2. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### **3.10 STARTING AND STOPPING**

- A. Where fresh masonry joins partially or totally set masonry, clean exposed surfaces of set masonry and wet lightly to obtain good bond with new work. Remove loose masonry and

mortar. If it is necessary to stop off horizontal run of masonry, step back 1/2 masonry unit length in each course. Do not tooth.

### **3.11 MASONRY (CMU) REBUILDING OF EXISTING OPENINGS:**

#### **A. Removal:**

1. Carefully remove by hand, at locations indicated after approval by Project Manager, any masonry which are damaged, spalled or deteriorated. Cut out full units from joint to joint and in manner to permit replacement with full size units.
2. Support and protect masonry indicated to remain which surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
3. Salvage as many whole, undamaged masonry units as possible. Sort removed masonry units with various types of damage for possible reuse.
4. Remove mortar, loose particles and soil from salvaged masonry by cleaning with brushes and water. Store masonry for reuse.
5. Clean remaining masonry at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.

#### **B. Masonry Rebuilding of Openings: To be used only at existing masonry / rebuilding locations for repair, and where approved by Project Manager.**

1. Install new or salvaged masonry to infill existing masonry openings. Fit replacement units into bonding and coursing pattern of existing masonry. (tooth in new and existing masonry) If cutting is required use motor driven saw designed to cut masonry with clean, sharp un-chipped edges.
2. Lay replacement masonry with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Use wetting methods suggested by manufacturer installation requirements. Maintain joint width for replacement units to match existing.
3. Match existing mortar. Tool exposed mortar joints in repaired areas to match joints of surrounding existing masonry work.
4. Re-point new mortar joints with existing joints where blend-in is required due to repair and infill of panel.

#### **C. Anchoring: Anchor existing and new masonry using the following:**

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 16 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 16 inches o.c. vertically.
2. Embed tie sections in masonry joints and install in accordance with the manufacturer's recommendations.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.



### **3.12 FIELD QUALITY CONTROL**

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
1. Payment for these services will be made by Owner.
  2. Owner's Testing Agency shall perform Level 2 Special Inspection as defined (in regard to inspection tasks required and frequency of inspection by ACI 530.1 1-99, including:
    - a. Inspect masonry construction and compare with pre-approved sample panel that establishes standard of quality and workmanship.
    - b. Inspect reinforcing for size and placement prior to pouring of grout. Inspect accessories for size, type, spacing galvanizing coating and proper installation.
    - c. Inspect grout and mortar mixing operations to ensure mix proportions and procedures comply with specified requirements.
    - d. Inspect masonry shear wall construction for compliance with the contract documents.
      - 1) Check wall support for dowels required to transfer loads from wall to support.
      - 2) Check wall for required grouting and reinforcing in block cores, bond beams, horizontal reinforcing, etc.
      - 3) Check top of wall method of shear transfer. This includes the spacing and location of shear wall clips, and the construction of the top of the wall.
    - e. Inspect each exterior masonry wall for required lateral support, at the top of the wall from beams and /or at the side from columns.
      - 1) Check those walls, where shown on the drawings as requiring wind clips at the top for compliance with the contract documents.
      - 2) Check those walls, where shown on the drawings as requiring support from columns, that the wall-column tie in detail is in compliance with the contract documents.
    - f. Inspect all aspects of masonry construction operations for compliance with specified cold weather and/or hot weather procedures. This may include, but is not limited to:
      - 1) Monitoring the temperature of masonry units, mortar, and grout.
      - 2) Inspection of protection, including windbreaks and enclosures, during construction.
- C. Testing Frequency: One set of tests for each 1000 sq. ft. of wall area or portion thereof.
1. Architectural Masonry: The faces shall conform to the requirements of ASTM C90.
  2. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
  3. Mortar Test: For each mix provided, per ASTM C 780.
  4. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

5. Prism Test: Prism test conducted to determine strength of masonry unit and mortar system in accordance with ASTM E447, Method B.
  - a. Prism tests performed at start of masonry construction and after completion of every 5,000 square feet of masonry wall.

### **3.13 CLEANING AND ADJUSTMENTS:**

- A. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: Cut out joints and holes in exposed masonry and re-point with mortar to match existing mortar. During tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent work to provide neat, uniform appearance, prepared for application of sealants.
- C. Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
  1. Cleaning:
    - a. Remove excess mortar and mortar smears as work progresses.
    - b. At end of each day turn scaffold boards over and brush down walls to remove mortar droppings from face of wall.
    - c. Dry brush masonry surface after mortar has set after final pointing.
    - d. Acid Solutions: Not allowed for cleaning unless specifically approved by Owner.
    - e. Clean masonry in accordance with masonry manufacturer's recommendations and BIA Tech Note 20 - "Cleaning Guide for New Masonry", latest edition, Table 1. Follow directions carefully, including presoak and rinsing.
      - 1) Use non-metallic tools in cleaning operations.
      - 2) Sand finish brick and molded brick: Do not power wash.
    - f. Upon completion of pointing and cleaning leave the work area and surrounding surfaces clean and free of mortar spots, droppings and broken masonry.
  2. Architectural Masonry:
    - a. Keep walls clean daily during installation using brushes, rags and the burlap squares supplied on the pallets. Do not allow excess mortar lumps or smears to

harden on the finished surfaces. Harsh cleaning methods after walls have been erected will mar the surface of the blocks.

- D. Final Cleaning: No acid cleaners shall be allowed. After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Test cleaning methods on sample wall panel approximately 10 square feet; leave one-half of panel un-cleaned approximately 10 square feet for comparison purposes.
  2. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
  3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering with polyethylene film or other covering acceptable to Architect.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  5. Clean masonry with a proprietary non-acidic cleaner applied according to manufacturer's written instructions and applicable NCMA "tek" bulletins.
  6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
  7. Utilize cleaning products recommended by Masonry Product manufacturer.
  8. Architectural Masonry Cleaning:
    - a. Clean the completed walls with PROSOCO "Light Duty Concrete Cleaner" in proportions recommended by the manufacturer. Follow the manufacturer's instructions including thorough rinsing. Do not use acid or abrasives on the finished surfaces. Follow manufacturer's instructions to avoid permanent damage to the finished faces. Do not apply Burnished Custom Masonry cleaner with pressure spray above 50 psi. Do not powerwash.

### **3.14 MASONRY WASTE DISPOSAL**

- A. Do not dispose of masonry waste as fill.
- B. Recycle waste in accordance with recycling and waste management plan requirements.
- C. Remove and recycle excess clean masonry waste, and other masonry waste, and legally dispose of off Owner's property in accordance with local jurisdiction requirements.

### **3.15 PROTECTION OF FINISHED WORK**

- A. Moisture Protection During Installation: Where exposed to weather, cover top of masonry walls at end of each day's work using waterproof material weighted down to insure its remaining in

place. Maintain such protection until top of wall is made permanently weatherproof by final capping and flashing.

- B. Mud Splatter Protection: Attach minimum of 4 feet of 6 mil polyethylene sheet to base of masonry walls to prevent staining by mud splatter. Maintain until landscaping and paving adjacent to building is complete. Remove at end of Project.
- C. Protect all corners with plywood and remove at the conclusion of work.
- D. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products.
- E. Protect installed products until completion of project.
- F. Protect masonry products from contact with mortar, soil, and other materials capable of staining or discoloring the finished product.
- G. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 042000

## **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.
- B. Related Sections:
  - a. DIVISION 06 - Rough Carpentry
  - b. DIVISION 07 – Bituminous Roofing
  - c. DIVISION 09 - High Performance Coatings: Paint finish.
  - d. MECHANICAL DIVISION - Heating Work.
  - e. ELECTRICAL DIVISION - Electric Work.
  - f. MECHANICAL DIVISION - Plumbing Work.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Structural steel as defined in American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges" and as otherwise shown on drawings.
  - 2. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

#### **1.3 SUBMITTALS**

- A. Procedures: Comply with requirements of DIVISION 01 - Submittals and as modified below.
- B. Product Data: Submit two copies of producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). Indicate by transmittal that copy of each applicable instruction has been distributed to Fabricators, Installers and Erectors.
  - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  - 2. High-strength bolts (each type), including nuts and washers.
  - 3. Anchor rods (each type), including nuts and washers.
  - 4. Structural steel primer paint.

- B. Shop Drawings: Submit shop drawings prepared under supervision of a Registered Professional Engineer, licensed in the state of the project, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.
1. Furnish complete shop drawings for all work of this section, including anchor rod plans, erection drawings, and detail fabrication drawings.
  2. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
    - a. Provide setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed as work of other sections.
  3. Reproductions of Contract Documents shall not be used for shop drawings.
  4. Use the same column grid numbering system throughout as that shown on the Contract Documents.
  5. The Contractor shall assume full responsibility for the accuracy, quality and character of the shop drawings and all their relationships to his field work. He shall check the shop drawings before submitting them to the Architect for review. If necessary, after the Architect's review, the Contractor shall make all changes and corrections necessary to make the shop drawings conform with the Contract Documents.
  6. The Architect's review will only cover the arrangement of the principal members and strength of connections. The Contractor shall remain responsible for the accuracy of dimensions.
  7. The shop drawings shall show all sizes, dimensions, and details necessary for the proper fabrication and erection of all work under this Section. Where provision must be made for attaching other materials to the structural steel work, the Contractor shall furnish the holes required.
  8. Shop drawings shall be made in general conformance with the standards and recommendations of the American Institute of Steel Construction.
- C. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.
- D. Surveys: Submit certified copies of each survey conducted by a registered land surveyor, showing elevations and locations of base plates and anchor rods to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and Contract Documents.

- E. Design Calculations: Submit design calculations, bearing the seal and signature of a Professional Engineer, employed by the Contractor and licensed in the state of the project location, for the following:
1. Connections not as indicated or not fully detailed in the Contract Documents.
  2. Request for substitution of member sizes or material grades.
  3. Modification of the strength or configuration of structural framing requested for the Contractor's convenience, erection sequence or construction equipment and/or materials.
  4. Such calculations shall be in conformance with the reference standards cited herein and shall clearly demonstrate applicability for the intended use.

#### **1.4 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. AISC "Code of Standard Practice for Steel Buildings and Bridges", latest edition.
  2. AISC "Specification for Structural Steel Buildings," including "Commentary," latest edition, and Supplements thereto as issued.
  3. AISC provisions for "Architecturally Exposed Structural Steel" in AISC "Code of Standard Practice for Steel Buildings and Bridges."
  4. AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" by the Research Council on Structural Connections.
  5. American Welding Society (AWS) D1.1 "Structural Welding Code – Steel," latest edition.
  6. ASTM A6 "General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling."
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months.
    - a. If re-certification of welders is required, retesting will be Contractor's responsibility, and at his expense.
- C. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such

inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components which do not comply.
- D. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## **1.6 REDESIGN**

- A. Redesign: If the Contractor makes or causes to be made any substantial changes in the type, form, system, or details of construction from those shown on the drawings, he shall pay all costs arising from such changes. The Contractor shall pay all engineering fees required to check the adequacy of such changes. Any changes or departures from the construction and details shown on the drawings shall be made only after an approval is obtained in writing from the Architect.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
  1. Structural Steel Shapes, Plates and Bars: ASTM A36, or ASTM A992, Grade 50, as noted on plan.
  2. Cold-Formed Steel Tubing: ASTM A500, Grade B.



3. Steel Pipe: ASTM A53, Type E or S, Grade B.
- B. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 through 1020, cold finished carbon steel; with dimensions complying with AISC Specification.
- C. Prefabricated, Fireproof, Steel Columns: Shall be of sizes as shown on drawings consisting of a load-bearing steel column encased in insulating material protected by an outer non-load-bearing steel shell. All prefabricated fireproof columns shall be "Fire-Trol" prefabricated fireproofed columns as manufactured by Lally Tubular of Orland Park, Illinois and bear the label of Underwriter's Laboratories, Inc., certifying the inspection manifest and hourly fire rating specified in the drawings.
- D. Slide Bearings: Fluorogold TFE Structural Expansion bearings as detailed on the drawings.
- E. Anchor rods: ASTM F 1554, non-headed type unless otherwise indicated.
- F. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and washers, as follows:
  1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
  2. Quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A490.
- G. Electrodes for Welding: E60 or E70. Comply with latest AWS Code. All electric current required shall be furnished by the Contractor.
- H. Shop Coat Primer Paint:
  1. For all steel, except where epoxy finish is specified: "Carbocoat 115" by Carboline Co., or "Series V10" by Tnemec Co. Color to be red, unless otherwise indicated by the Architect.
  2. For steel where epoxy finish is specified: "Carboline 893" by Carboline Co., or "FasPrime 160-1212" by Tnemec Co. Color shall be grey.
- I. Galvanizing (Hot Dip): ASTM A123, and ASTM A153, as applicable.
- J. Shop Applied Zinc Rich Primer (for steel not galvanized and exposed to weather in its final position, and as otherwise specified):
  1. "CarboZinc 11 HS" by Carboline Co., or "Series 90-97 Tneme-Zinc" by Tnemec Co.
- K. Field Applied Topcoat:

1. "Carbothane 133 HB" by Carboline Co., or "Series 73 Endura-Shield " by Tnemec Co. Color selected by Architect.
- L. Galvanized Finish Touch-up: Touch-up paint shall be an organic cold-galvanizing compound having a minimum of 94% zinc dust in dry film. "Carboline Galvonox Type I" as manufactured by Carboline Co.

## **2.2 FABRICATION**

- A. General: Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the approved final shop drawings.
- B. Bearing surfaces shall be planned to true beds and abutting surfaces shall be closely fitted. All columns and all bearing stiffeners shall be milled to give full bearing.
- C. Bolt holes shall be drilled or punched in accordance with AISC Specifications, subject to the provisions specified herein. Holes shall be accurately centered and shall register true upon erection. Poor matching of holes shall be cause for a rejection. Small errors may be repaired by drilling or reaming, with approval of Architect.
- D. Contact surfaces shall be thoroughly cleaned before assembly. Assembled parts shall be brought into close contact. Drift pins shall be used only for aligning members and shall not be used in a manner which will damage metal or enlarge or distort holes. Members requiring accurate alignment shall be provided with slotted holes and/or washers for truing up the steel as required. All finished members shall be true to line and free from twists, bends, and open joints.
- E. Provide an acceptable adjustable type of hanger or clip, with high strength bolts, for vertical and horizontal adjustment for all supported lintels. Lintels shall be supplied to accommodate all openings. Provide a lintel schedule for all openings with shop drawing submissions.
- F. Cap plate, seat, and stiffener connections shall not be permitted to interfere with architectural clearances. Particular attention shall be paid to window head and ceiling details. Adjust details to suit.
- G. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated. All beams shall be fabricated with rolling camber up.
- H. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- I. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

- J. Connections: All connections shall be AISC standard framed or equivalent. Connections to be adequate to provide for the reactions shown on the drawings, or the reaction due to the maximum uniformly distributed load that the beam is capable of carrying for its span based on the allowable unit stresses, whichever is greater. For composite construction 1.4 times the maximum, uniformly distributed load shall be used unless a greater reaction is shown on the drawings.
- K. Shop connections shall be welded or high-strength bolted using slip critical connections. All field connections shall be high-strength bolted, using slip critical connections, unless noted otherwise on the drawings. Field connections which are simple shear connections for gravity loaded beams may be high-strength bolted, using bearing connections with threads included in the shear plane.
- L. Details shall be designed to provide the main stress connection in the shop connected part, and the field bolts shall be arranged to avoid eccentricity in bolted connections.
- M. Knife-type connections, shear bar connections and combinations of bolts and welds in the same connections are not permitted, unless otherwise detailed.
- N. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" (RCSC). High-strength bolts shall have a suitable identifying mark placed on top of heads before leaving factory. Hardened washers shall be used under the turning element of all high-strength bolts and as required by the referenced standard.
  - 1. Tightening of bolts in connections shall conform to one of the four methods described in the AISC "Specification for Structural Joints Using A325 or A490 Bolts", Section 8.2. Minimum tension for bolts of size used shall be in accordance with table listed in referenced standard. Bolts which have been completely tightened shall be marked with an identifying symbol.
- O. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- P. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
- Q. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
- R. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
- S. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

- T. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on Architectural drawings.
- U. Masonry Wall Anchors: Provide masonry wall anchors welded to steel beams and columns as shown on structural and architectural drawings.

### **2.3 SHOP PAINTING**

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
- B. Paint shall be delivered to the shop in original sealed containers which shall be clearly marked with the manufacturer's name and the identifying brand number or name. The paint shall be used as prepared by the manufacturer without thinning or other admixtures.
  - 1. If a proper class primer is selected, and if the steel surfaces are properly prepared, apply primer to all surfaces except within 3 inches of designated field weld areas. Otherwise, for slip critical type connections, surfaces must be masked within three inches of high strength bolt holes.
  - 2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing, unless otherwise noted.
  - 3. Do not paint the top flange surface of any beam which receives shear studs.
  - 4. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first coat.
- C. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
  - 1. For all steel, except steel receiving an epoxy primer or zinc-rich primer: SSPC-SP-3 "Power Tool Cleaning."
  - 2. Steel not galvanized, steel receiving an epoxy primer or zinc-rich primer: SSPC-SP-6, "Commercial Blast Cleaning."
- D. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's written instructions and at the manufacturer's specified maximum dry film thickness for each type of material used. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

### **2.4 GALVANIZING**

- A. Steel members, fabrications, and assemblies shall be galvanized by the hot dip process in accordance with ASTM A123.

- B. Bolts, nuts, and washers and iron and steel hardware components shall be galvanized by the hot-dip process in accordance with ASTM A153.
- C. Surface preparation: Steel shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter: Clean steel in accordance with Steel Structures Painting Council (SSPC) SSPC-SP-6, "Commercial Blast Cleaning."
- D. Coating Requirements:
  - 1. Weight: The weight of the galvanized coating shall conform to Tables 1 and 2 of ASTM A123 or Table 1 of ASTM A153, as appropriate.
  - 2. Surface Finish: The galvanized coating shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect that is detrimental to the stated end use of the coated article.
    - a. The integrity of the coating shall be determined by visual inspection and coating thickness measurements.
    - b. Where slip factors are required for slip critical connections, these shall be obtained after galvanizing by suitable treatment of the faying surfaces in accordance with the latest edition of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" as approved by the Research Council on Structural Connections.
  - 3. Adhesion: The galvanized coating shall be sufficiently adherent to withstand normal handling during transport and erection.
- E. Touch-Up and Repair:
  - 1. Mechanical Damage

Areas damaged by welding, flame cutting, or during handling, transport or erection shall be repaired by one of the following methods:

    - a. Cold Galvanizing Compound
      - 1) Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil, grease and corrosion products.
      - 2) Areas to be repaired shall be power disc sanded to bright metal. To ensure that a smooth reconditioned coating can be affected, surface preparation shall extend into the undamaged galvanized coating.
      - 3) The touch-up paint shall be spray or brush applied in multiple coats until a dry film thickness of 8 mils minimum has been

achieved. A finish coat of aluminum paint shall be applied to provide a color blend with the surrounding galvanizing.

- 4) Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

b. Zinc Based Solder

- 1) Surfaces to be reconditioned with zinc-based solder shall be clean, dry, and free of oil, grease and corrosion products.
- 2) Areas to be repaired shall be wire brushed.
- 3) Heat shall be applied slowly and broadly close to, but not directly onto, the area to be repaired. The zinc-based solder rod shall be rubbed onto the heated metal until the rod begins to melt. A flexible blade or wire brush shall be used to spread the melt over the area to be covered. The zinc-based solder shall be applied in a minimum thickness of 2 mils.
- 4) Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

2. Wet Storage Stain

- a. Any wet storage stain shall be removed by the galvanizer if formed and discovered prior to leaving the galvanizer's plant unless late pick up or acceptance of delivery has necessitated the material being stored in unfavorable conditions. In any event, wet storage stain shall be removed before installation so that premature failure of the coating will not occur. Wet storage stain shall be removed as follows:
  - 1) The objects shall be arranged so that their surfaces dry rapidly.
  - 2) Light deposits shall be removed by means of a stiff bristle (not wire) brush. Heavier deposits are to be removed by brushing with a 5% solution of sodium or potassium dichromate with the addition of 0.1% by volume of concentrated sulfuric acid. This shall be applied with a stiff bristle brush and left for about 30 seconds before thoroughly rinsing and drying. Alternatively, a proprietary product such as Oakite Highlite, or equal, which is intended for this purpose may be used according to manufacturer's recommendations.
  - 3) A coating thickness check shall be made in the affected areas to ensure that the zinc coating remaining after the removal of wet storage stain is sufficient to meet or exceed the requirements of the specification.

## **PART 3 - EXECUTION**

### **3.1 FIELD OPERATION**

- A. Contractor shall carefully examine the Contract Documents to ascertain the exact amount of work required and to fully inform himself of all conditions to be fulfilled in connection with erection of the work. He shall also inform himself with regard to such site conditions which affect his work.
- B. Contractor shall furnish all anchor rods, leveling plates, and bearing plates as required for the steel and approved setting plans for same in time for installation under Section 033000 – Cast-in-place Concrete where applicable. Contractor shall set and grout all anchor rods, leveling plates and bearing plates.
- C. Surveys: Employ a land surveyor licensed in the state of the project who is experienced in steel erection to certify the accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor rods and similar devices before erection work proceeds and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until agreed upon with Architect. Provide timely certification by the Surveyor that all exterior members and members adjacent to elevator shafts, at each floor, have been erected to tolerances conforming to the AISC Code of Standard Practice. No final bolting or welding shall be performed until the licensed Surveyor has determined that all members described above, for the tier in question, are in their proper location. The licensed surveyor shall indicate any deviation from AISC tolerances. The licensed Surveyor shall also set final locations of adjustable slab edge angles as called for on the Contract drawings.
- D. All structural steel shall be erected as rapidly as the progress of the general work will permit. All structural steel shall be set accurately to the lines and levels established on the drawings.
- E. Care shall be taken to have the work plumb and level before the permanent connections are made. Plumbness shall be so maintained by Contractor until the permanent bracing is in place, whether bracing is obtained by virtue of walls, floors, or steel framing.
- F. Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints Using ASTM A325 and A490 Bolts." All high-strength bolt connections to be slip critical type connections, unless otherwise noted.
- G. High-tension bolts shall be installed with properly calibrated power wrenches.
- H. All members shall be connected temporarily with sufficient bolts to ensure the safety of the structure until it is finally bolted, and not less than one-third of the holes shall be bolted.
- I. The sections of columns, beams, and girders shall not be cut or altered without the written consent of the Architect.

- J. Contractor shall provide all barricades, scaffolding, and other means of protection as may be required to comply with the Federal and State laws and municipal ordinances and to safeguard adequately property and persons.

### **3.2 BRACING**

- A. Contractor shall install all necessary temporary horizontal and vertical bracing to resist all forces including wind coming on the framing. The bracing shall be installed as soon as practical in order to maintain the framing in a secure condition.
- B. Contractor shall assume full responsibility for the stability of framing during erection. Column anchor rods shall not be relied upon for column stability during construction. The bracing shall be sufficient to resist the weight and operation of all construction equipment.
- C. The bracing shall be left in place as long as necessary to maintain the building square and plumb in all its parts until the floors, roofs, or other means of permanent bracing are installed. The bracing shall be removed by the Contractor progressively or at one time as may be necessary to satisfy the above condition.

### **3.3 REAMING**

- A. Light drifting will be permitted to draw the parts together, but drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections in the field shall be done by reaming with twist drills, care being taken not to weaken the adjoining metal. If, in the judgement of the Architect, the extent of the reaming is such that holes cannot be properly filled or accurately adjusted after reaming, the faulty member shall be discarded and replaced with a new one, and all costs and expenses resulting therefrom shall be paid by the Contractor.

### **3.4 CUTTING AND FITTING**

- A. No cutting of sections, either flanges, webs, stems or angles shall be done by the Contractor without the consent of the Architect, unless this cutting is particularly specified or shown on the drawings.

### **3.5 TOUCH-UP PAINTING**

- A. Immediately after erection, clean field welds, bolted connections and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. No painting shall be done in wet or freezing weather, and all surfaces shall be perfectly clean and dry when the paint is applied.

### **3.6 FIELD TOP-COATING PAINTING**

- A. After touch-up painting apply finish topcoat to structural steel in accordance with high performance painting specification in Division 09. Apply per manufacturer's



recommendations. Unless otherwise noted, provide a minimum dry film thickness of 5 mils. Color as selected by Architect from full range of colors.

### **3.7 TOUCH-UP AND REPAIR OF GALVANIZING**

- A. Immediately after erection, clean and repair any damaged galvanizing as outlined in previous section regarding galvanizing.

### **3.8 REMOVAL OF EQUIPMENT**

- A. Upon completion of this work, the Contractor shall remove from the site, all derricks and other equipment promptly, to avoid delaying work of other sections.

### **3.9 CORRECTIVE MEASURES**

- A. Any errors in locations or inaccuracies in the setting of anchor rods, leveling plates, base plates, bearing plates or other items of attachment or support for steel work shall be reported to the Architect and shall be corrected in a manner subject to the approval of the Architect.
- B. Any misfits due to errors in fabrication shall be reported immediately to the Architect along with proposed method of correction of same, and his approval obtained before proceeding with corrective measures.
- C. No members shall be cut or burned without specific approval in writing.
- D. Bolted or welded connections, joints or fastenings which are classified as defective in the opinion of the Architect shall be corrected by the Contractor in a manner subject to the Architect's approval.

### **3.10 QUALITY CONTROL**

- A. The Contractor shall notify the Architect in writing five days in advance of the starting of fabrication and of erection of the structural steel.
- B. The Owner and his agents shall have free access and the Contractor shall provide same, to all points where materials for this project are being fabricated and/or erected, and all materials, equipment and workmanship shall be subject to inspection, tests and approval by the Owner's agents or laboratories. They shall have full authority to reject all material and work that fails to conform in every respect to these specifications.
- C. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- D. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

- E. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirement.
  
- F. Shop inspection will include periodic inspection at the place of fabrication and identification of tested material, checking of fabrication for compliance with approved shop drawings and these Specifications, and inspection of shop painting, as well as the following:
  - 1. Examination of all steel for straightness and alignment.
  - 2. Examination of all fabricated pieces and checking of same with erection plans and detail drawings.
  - 3. Shop-Bolted Connections: Inspect in accordance with AISC Specifications. See paragraph entitled "High-Strength Bolt Inspection" below.
  - 4. Shop Welding: Inspect and test during fabrication of structural steel assemblies as follows:
    - a. Check that welders are certified. Record type and locations of defects found in work. Record work required and performed to correct deficiencies or defects found.
    - b. Perform periodic visual inspections of random welds.
    - c. Perform the following:
      - 1) Ultrasonic Inspections: ASTM E164. 100% of first 40 butt welds or more until rejection rate is less than 5% and then 25% as long as rejection rate remains below 5%.
      - 2) Magnetic Particle Testing: ASTM E109. 25% of fillet welds with size larger than 3/8".
  - 5. Examination of surface preparation, painting/priming and galvanizing.
  
- G. Field inspection will include periodic inspection after delivery at site of material, fabrication, and shop painting, and work connected with erection and field painting of steel structure, as well as the following:
  - 1. Proper erection of all pieces.
  - 2. Proper installation of bolts.
  - 3. Plumbness of structure.
  - 4. Condition of shop painting after erection and field touch-up painting.

5. Field-Bolted Connections: Inspect in accordance with AISC specifications. See paragraph below titled "High-Strength Bolt Inspection."
6. Field Welding: Inspect and test during erection of structural steel as follows:
  - a. Check that welders are certified. Record types and locations of defects found in work. Record work required and performed to correct deficiencies or defects found.
  - b. Perform periodic visual inspections of random welds.
  - c. Perform the following:
    - 1) Ultrasonic Inspection: All penetration welds performed in the field shall be tested by ultrasonic testing.
    - 2) Magnetic Particle Testing: ASTM E109. 25% of fillet welds with size larger than 3/8".
7. High-Strength Bolt Inspection: Perform inspection of installation of high-strength bolts to determine that selected installation procedures as prescribed in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" are properly used and that bolts are properly tightened and as follows:
  - a. All bolted connections shall be visually inspected.
  - b. At least two bolts of every connection between girders and columns, and trusses and columns shall be checked.
  - c. All bolted connections that fail shall be corrected and all bolts in that connection shall be retested.
- H. Contractor shall correct deficiencies in structural steel work, which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to re-confirm any non-compliance of the original work, and as may be necessary to show compliance of corrected work.
- I. When required by Architect or Owner's Independent Testing Agency or Contractor's engaged Inspection Organization, Contractor shall make available to Inspector a calibrated torque wrench and calibrating device, as well as the manpower required to operate same, for the purpose of checking high-strength bolts. Adequate platforms and scaffolding shall be provided to ensure safe performance of this operation.
- J. Report Copies and Timing: Immediately after tests or inspection have been made, and in no case later than seven (7) days after tests of inspection have been made, the laboratory shall furnish copies of all test and inspection reports as follows:
  1. One (1) copy to the Architect.

2. One (1) copy to the Contractor.
3. One (1) copy to the Owner.
4. One (1) copy to the Structural Engineer.

END OF SECTION 052100

## **SECTION 055000 - METAL FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
- B. Extent of miscellaneous metal is shown on Drawings and includes items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings required for a complete and operable facility. Types of miscellaneous metal items include (but are not limited to) the following:
  - 1. Miscellaneous steel framing and supports not specified elsewhere.
  - 2. Loose bearing and leveling plates.
  - 3. Steel weld plates and angles.
  - 4. Miscellaneous steel trim.
  - 5. Pipe guards.
  - 6. Loose steel lintels.
  - 7. Carpenters iron work.
  - 8. Miscellaneous steel channels.
  - 9. Gratings and hinges.
  - 10. Miscellaneous steel angles, bent plates, and shapes.
  - 11. Precut and galvanized steel angle lintels and relieving angles.
  - 12. Provide non-magnetic stainless steel for fastenings, hangers, or straps, for contact with pressure treated wood items. Special galvanizing required for pressure treated lumber fasteners. Refer to Section 061000 Rough Carpentry for requirements.
  - 13. All other miscellaneous angles, channels, tubes, plates, bars, pins and other items as required to complete project whether indicated or not.
- C. Related Sections:
  - 1. DIVISION 04 - Unit Masonry Assemblies
  - 2. DIVISION 05 – Structural Steel
  - 3. DIVISION 06 - Rough Carpentry
  - 4. DIVISION 09 - High Performance Coatings: Paint finish.
  - 5. MECHANICAL DIVISION - Heating Work.
  - 6. ELECTRICAL DIVISION - Electric Work.
  - 7. MECHANICAL DIVISION - Plumbing Work.

#### **1.2 REFERENCES**

- A. Reference Standards: See DIVISION 01. Comply with following:
  - 1. AISC Manual: AISC Manual of Steel Construction, Current Edition.
  - 2. AISC Specification: AISC S335 Specification for Structural Steel Buildings, Current Edition.
  - 3. AISC Code: AISC S302 Code of Standard Practice for Steel Building and Bridges, Current Edition.
  - 4. ANSI A14.3 - American National Standard for Ladders - Fixed - Safety Requirements; Current Edition.

5. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; Current Edition.
6. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; Current Edition.
7. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; Current Edition.
8. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; Current Edition.
9. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; Current Edition.
10. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; Current Edition.
11. AWS A2.4 - Standard Symbols for Welding, Brazing, and Non-destructive Examination; American Welding Society; Current Edition.
12. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; Current Edition.

### **1.3 SUBMITTALS**

- A. Procedures: Comply with requirements of DIVISION 01 - Submittals and as modified below.
- B. Product Data: for the following:
  1. Grout where applicable.
  2. Miscellaneous metal angles and shapes for work.
  3. New roof openings.
- C. Prepare design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in State in which project is located. Provide signed and sealed shop drawings and calculations by Structural Engineer licensed in State in which project is located.
- D. Shop Drawings: Submit shop drawings for fabrication and erection of all assemblies of miscellaneous metal not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale and include details and sections and connections at not less than 3' to 1'-0" scale. Show anchorage and accessory items.
  1. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Shop drawings for railings shall be provided under the supervision of a Professional Structural Engineer, licensed in the state in which the project is located, and the shop drawings and calculations shall be signed and sealed when submitted for Architects review.
    - a. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- E. Templates: For anchors and bolts.
- F. Samples: For each type and finish of extruded nosing and tread.
- G. Quality Control Submittals:
  1. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable)

indicating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.

- H. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

#### **1.4 QUALITY ASSURANCE**

- A. Qualifications of Welders: Use only certified welders and the shielded arc process for all welding.
- B. Codes and Standards: In addition to complying with all pertinent codes and regulation for the project location, fabrication and erection of miscellaneous metal shall be in accordance with American Welding Society "Code for Welding in Building Construction".
- C. Conflicting Requirements: In event of conflicts between pertinent codes and regulations and requirements of referenced standards or this technical specification section, the more stringent provisions govern.

#### **1.5 REGULATORY REQUIREMENTS**

- A. See DIVISION 01, Comply with:
  - 1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped.
  - 2. Americans with Disabilities Act 28 CFR Part 36.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. General: Comply with DIVISION 01.
  - 1. Store metals above ground on platforms, skids, or other supports. Protect steel from corrosion.
  - 2. Store other materials in weather tight and dry place, until ready for use.

#### **1.7 PROJECT/SITE CONDITIONS**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of miscellaneous metal items. However, do not delay project progress. Allow for trimming and fitting wherever taking field measurements before fabrication might delay project.
- B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly of units at project site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation

### **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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified or approved equal.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
  - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 2. Stainless-Steel Bars and Shapes: ASTM A 276, Type
  - 3. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C.
  - 4. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
  - 5. Steel Tubing: ASTM A 500, cold-formed steel tubing.
  - 6. Steel Pipe: ASTM A 53/A 53M, Grade A, black finish unless galvanizing is required. Standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
  - 7. Slotted Channel Framing: Cold-formed metal channels complying with MFMA-3, 1-5/8 by 1-5/8 inches minimum or as indicated on drawings. Channels made from galvanized steel complying with ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness.
  - 8. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
  - 9. Galvanized wire for bird screen: 16-gauge material.
  - 10. Welding Materials: AWS D1.1; type required or recommended for materials being welded.
- C. Nonferrous Metals:
  - 1. Aluminum Extrusions: ASTM B 221 alloy 6063-T6.
  - 2. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
  - 3. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

## 2.3 FASTENERS

- A. General: **Type 316 stainless-steel fasteners or better** for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. **Provide stainless-steel fasteners for fastening aluminum or where in contact with wood preservative treated material (wood products). Select fasteners for type, grade, and class required.**
- B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron, or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dipped galvanized per ASTM A 153/A 153M.
- C. Masonry Anchorage Devices:
  - 1. Expansion Shields: Complying with FS-S-325.
  - 2. Bolt Anchor Expansion Shields for Bolts: closed-end bottom bearing class, group II Type 2, class.
- D. Toggle Bolts: Tumble wing type, complying with FS FF-B-588, Type, Class and Style as required.
- E. Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Where fastener is exposed to weather, in ground contact, in area of high relative humidity, or in



contact with wood preservative treated material, provide Type 316 stainless steel fastener. Select fasteners for type, grade and class required.

1. Bolt and Nuts: Regular hexagon head, type, ASTM A 307, Grade A.
2. Lag Bolts: Square head type, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round, carbon steel, FS-FF-W-92.
6. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

## **2.4 MISCELLANEOUS MATERIALS**

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107.

## **2.5 FABRICATION**

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces. Fabricate in accordance with details and accepted Shop Drawings. Items for use on exterior of building shall be hot dipped galvanized after fabrication.
  1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
  2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
  3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
  4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
  5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches oc.
  6. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
  7. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
  8. Welding: AWS D1.1. Miter and cope intersections and weld all around. Remove splatter, grind exposed welds to blend and contour surfaces to match those adjacent.
- B. Miscellaneous Framing and Supports: Provide steel framing and support's, not specified in other Sections, as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  1. Fabricate steel supports / girders for wood frame construction from continuous steel shapes. Where wood nailers are attached to supports / girders with bolts or lag screws, drill holes at 24 inches oc.

2. Fabricate steel pipe columns for supporting wood frame construction with steel baseplates and top plates welded to pipe with fillet welds the same size as pipe wall thickness.
- C. Miscellaneous Steel Trim: 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. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  1. Exterior Miscellaneous Steel Trim: Hot dipped Galvanized.
- D. Pipe Guards / Conduit Guards: Fabricate 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.

## **2.6 FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Shop prime steel items with exception of items which come pre-finished.
  1. Exceptions: Galvanize exterior items and items to be embedded in concrete or masonry.
  2. Exceptions: Do not prime surfaces in direct contact with concrete and masonry, where field welding is required, and items to be covered with sprayed fireproofing.
  3. Prepare surfaces to be primed in accordance with SSPC-SP2.
  4. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
  5. Primers: As specified below.
    - a. Shop Prime Painting: SSPC-Paint 15, Type 1, red oxide except where otherwise indicated for exterior use.
    - b. Primer for items requiring High Performance Coatings: As specified in SECTION 09.
    - c. Touch-Up Primer for Galvanized Surfaces: Tnemec Zinc Rich Primer or approved equal.
    - d. Prime Painting: One coat.
- C. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.
- D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.
  1. Galvanizing: Provide zinc coating for items shown on Drawings or specified to be galvanized using hot-dip process after fabrication as follows:
    - a. Iron and Steel Hardware: Comply with ASTM A-153.
    - b. Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip 1/8" Thick or Heavier: Comply with ASTM A-123, provide minimum of 1.3 oz/sq ft galvanized coating.
    - c. Assembled steel products: Comply with ASTM A-386.
  2. For Finishes of Exterior Metal, Interior Metal and Galvanized Structural Steel and Metal Fabrications refer to DIVISION 09 – HIGH PERFORMANCE COATINGS.

3. Exterior Ferrous Metal Railings and Handrails, Fences, Gates: Finishes shop-applied after cleaning to bare metal, all surfaces coated including surfaces to be concealed or embedded in concrete. Refer to coatings noted in DIVISION 09 – HIGH PERFORMANCE COATINGS.
- E. Carpenter’s Iron Work: Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Where material is exposed to weather, in ground contact, in area of high relative humidity, or in contact with wood preservative treated materials, provide Type 304 stainless steel.
1. Where carpenter’s iron work is in contact with fire retardant or treated wood material and fully covered and protected from the weather provide material separation between the wood and iron work using #30 building paper or EPDM membrane with self-adhesive or approved equal.

## **2.7 FABRICATION TOLERANCES**

- A. Conform to following:
1. Squareness: 1/8-inch maximum difference in diagonal measurements.
  2. Maximum Offset Between Faces: 1/16 inch.
  3. Maximum Misalignment of Adjacent Members: 1/16 inch.
  4. Maximum Bow: 1/8 inch in 48 inches.
  5. Maximum Deviation from Plane: 1/16 inch in 48 inches.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which materials in this section are to be installed. Coordinate with the General Contractor and confirm conditions are satisfactory in writing, with copies to the Owner’s Representative and Architect, identifying any conditions detrimental to the proper and timely installation of the work that require correction. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer / Contractor.
- B. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner’s Representative and Architect. Failure to submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.
- C. Verify that field conditions are acceptable and are ready to receive work.

### **3.2 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- C. Provide protection, as recommended by manufacturer, when pressure treated lumber comes in contact with galvanized or prime coated steel.

1. Where iron work is in contact with fire retardant or treated wood material and fully covered and protected from the weather provide material separation between the wood and iron work using #30 building paper or EPDM membrane with self-adhesive backing or approved equal.

### **3.3 INSTALLATION**

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
  1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dipped galvanized after fabrication.
  2. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
  3. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting and Placement
  1. Perform all cutting, drilling, and fitting required for installation of miscellaneous metal items. Set items accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing of anchors in formwork for items built into concrete, masonry or similar construction.
  2. Fit exposed connections accurately together to form tight hairline joints. Weld connections, which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind smooth and touch up shop paint coat.
- C. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with non-shrink, non-metallic grout.
- D. Pipe and Conduit Guards: Provide whether or not indicated on contract drawings. Provide guards, of indicated design, at each area in which vertical piping would be in danger of getting banged or broken along each level areas where pipes come down in building or come in contact with a travel area. Where possible contractor shall coordinate pipe drops to occur behind columns or within walls to avoid damage.
- E. Bird Screens at louver exhaust areas. Install units securely with metal fasteners as recommended by manufacturer. Refer to Contract Drawings for locations of louvers.
- F. Touch up surfaces and finishes after erection.
  1. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc-welding, appearance and quality of welds made, and methods used in correcting welding.
    - a. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint all exposed area with same material used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.

2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### **3.4 ERECTION TOLERANCES**

- A. Comply with following tolerances:
  1. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
  2. Maximum Offset from True Alignment: 1/4 inch.
  3. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055000

## **SECTION 061000 - ROUGH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
1. All wood shall be Fire Retardant Treated Wood (FRTW) materials to comply with the building code classification of the facility.
  2. Rough opening framing for roof openings.
  3. Underlayment.
  4. Roof-mounted curbs.
  5. Roofing nailers.
  6. Roofing cant strips.
  7. Miscellaneous framing and sheathing.
  8. Communications and electrical mounting boards.
  9. Concealed wood blocking, nailers, and supports.
  10. Miscellaneous wood nailers, furring, and grounds.
  11. Pressure Treated Lumber - direct ground contact.

#### **1.2 RELATED REQUIREMENTS**

- A. DIVISION 05 - Metal Fabrications
- B. DIVISION 05 – Structural Steel
- C. DIVISION 07 - Bituminous Roofing
- D. DIVISION 07 - Sheet Metal Flashing and Trim
- E. DIVISION 07 - Roof Accessories
- F. MECHANICAL DIVISION - Heating Work
- G. ELECTRICAL DIVISION - Electric Work
- H. MECHANICAL DIVISION - Plumbing Work

#### **1.3 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard; current edition.
- B. APA PRP-108/ APA PRP-108, Form B455 - Performance Standards and Qualification Policy for Structural-Use Panels;
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;
- D. ASTM C 208 - Standard Specification for Cellulosic Fiber Insulating Board;
- E. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation;
- F. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board;
- G. ASTM D 2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing;
- H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials;
- I. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association;
- J. AWPA C9 - Plywood - Preservative Treatment by Pressure Processes; American Wood-Preservers' Association;

- K. AWWA C20 - Structural Lumber - Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association;
- L. AWWA C27 - Plywood - Fire-Retardant Treatment by Pressure Processes; American Wood-Preservers' Association;
- M. AWWA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association; current edition
- N. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.;
- O. PS 1 - Structural Plywood;
- P. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce);
- Q. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.;
- R. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association;
- S. Forest Stewardship Council's Principals and Criteria
- T. Under Writers Laboratories

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 - SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Provide technical data on insulated sheathing, wood preservative materials, wood products, and application instructions not insulation sheathing.
  - 2. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- C. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01.

#### **1.5 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
  - 1. Interior wood materials shall comply with ASTM E-84 test requirements for "Standard Test method for Surface Burning Characteristics of Building Materials".
  - 2. Exterior wood materials shall comply with ASTM D-2898 test requirements for "Standard Test method of Accelerated Weathering of Fire Retardant Treated Wood for Fire Testing".
- B. Source Limitations for Engineered Wood Products: Obtain each type of wood product through one source from a single manufacturer.
- C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-treated wood product through one source from a single producer.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.
- C. Handle products in conformance with the manufacturer's requirements.
- D. Refer to DIVISION 01 requirements for product delivery, storage and handling.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.
- C. Provide sustainably harvested wood.
- D. Lumber fabricated from recovered timber (abandoned in transit) is permitted in lieu of sustainably harvested lumber, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

### **2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Grading Agency: West Coast Lumber Inspection Bureau (WCLB).
- C. Grading Agency: Western Wood Products Association (WWPA).
- D. Sizes: Nominal sizes as indicated on drawings, S4S.
- E. Moisture Content: S-dry or MC19.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

### **2.3 CONSTRUCTION PANELS**

- A. Communications and Electrical Mounting Boards: PS 1 A-D plywood, fire retardant treated wood; 3/4-inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84. Painted one prime coat and two finish coats of latex paint, color selected by Architect / Engineer; or approved equal. Mounting Boards to be installed floor to ceiling and corner to corner within room, unless obstructions exist within the space.

### **2.4 ACCESSORIES**



- A. Fasteners and Anchors:
  - 1. Anchors: Toggle bolt type for anchorage to hollow masonry; Bolt or ballistic fastener.
  - 2. Where bolts or fasteners are in contact with chemically treated lumber provide Type 316 stainless steel or better to comply with the lumber manufacturer's chemical treatment restrictions and compatibility of products to prevent corrosion.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
  - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing per ASTM A 653/A 653M.
- C. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 30 asphalt felt), un-perforated.

**2.5 FIRE TREATMENT FOR INTERIOR AND EXTERIOR WOOD USED ON THE BUILDING**

- A. All lumber used on the building interior and exterior must conform to the non-combustible requirements of the building code. All wood products shall be Fire Retardant Treated Lumber (FRTW) including Plywood.
- B. **PRODUCT IDENTIFICATION REQUIREMENTS**
  - 1. Lumber and plywood bearing the fire-retardant treated wood marking / stamp indicating is has a flame spread rating of 25 or less (Class A) when tested in accordance with ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials". Fire retardant treated wood shows no evidence of significant progressive combustion when the test is extended for an additional 20-minute period. In addition, the flame front shall not progress more than 10½ feet beyond the centerline of the burners at any time during the test. The flame spread and smoke developed index for each species and product are classified by Underwriters Laboratories Inc. (UL).
  - 2. Fire retardant treated wood is manufactured under the independent third-party inspection of Underwriters Laboratories Inc. (UL) Follow-Up Service and each piece shall bear the UL classified mark indicating the extended 30-minute ASTM E84 test.
  - 3. Fire retardant treated wood shall be labeled kiln dried after treatment (KDAT). Timber Products Inspection, Inc. (TP) shall monitor the process and the TP mark shall appear on the label.
  - 4. Fire retardant treated wood shall be produced in accordance with ICC Evaluation Service Report 1791 (ESR-1791) latest version.
  - 5. Fire retardant treated wood meets the performance requirements of AWPA U1, Commodity Specification H for Use Category UCFA and AWPA C20/C27 (Type A, HT).
  - 6. Fire retardant treated wood is listed on the Department of Defense (DoD) Qualified Products List (QPL) and meets the requirements of MIL-L-19140-E as a Type 1 fire retardant treatment for lumber and plywood.
- C. **FIRE RETARDANT TREATMENT**
  - 1. Treatment shall be manufactured by an approved treatment manufacturer.
  - 2. Manufacturer shall produce Interior "Type A" fire retardant with individual surface burning characteristics for the species and products listed under UL Certifications.
  - 3. Structural performance of fire-retardant treated wood has been evaluated in accordance with ASTM D 5664 for lumber and ASTM D 5516 for plywood.

4. Evaluation of plywood data is in accordance with ASTM D 6305. Evaluation of lumber data is in accordance with ASTM D 6841.
5. The resulting design value and span rating adjustments are published in ICC Evaluation Report ESR-1791, which includes evaluation of high temperature (HT) strength testing for roof applications.
6. Interior fire-retardant treated wood is kiln dried after treatment (KDAT) to maximum moisture content of 19% for lumber and 15% for plywood.
7. Fire retardant treated wood does not contain VOC's, urea formaldehyde or formaldehyde, halogens, sulfates, chlorides, or ammonium phosphate.
8. Plywood treated with fire retardant treatment shall be manufactured under US Product Standard PS 1 or PS 2. Panels shall have a minimum bond durability of Exposure 1.
9. Grade marked lumber treated with fire retardant treated wood manufacturers mark shall be in accordance with PS 20.

**D. FIRE-RETARDANT-TREATED(FRT) MATERIALS:**

1. General: For all lumber and plywood, provide fire-retardant-treated wood (FRTW) materials that comply with performance requirements in AWWA U1 Commodity Specification H. Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction. Fire retardant treatment for wood, including framing, decking, sheathing and other wood construction, not exposed to weather.
2. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 3201 or ASTM D 5664 for lumber, and ASTM D 5516 for plywood.
3. Use treatment that does not promote corrosion of metal fasteners.
4. 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.
5. Manufacturers; or approved equal:
  - a. Hoover Treated Wood Products, Inc.
    - 1) Pyro-guard (FRT)
    - 2) Contact: 154 Wire Rd.; Thomson, GA 30824; Toll Free Tel: 800-TEC-WOOD; Tel: 706-595-5058; Fax: 706-595-1326; Email: [request info](mailto:request info); Web: [www.frtw.com](http://www.frtw.com)
  - b. Manufacturer: Chemical Specialties, Inc.
    - 1) D-Blaze (FRT)
    - 2) Contact: One Woodlawn Green, Suite 250, 200 East Woodlawn Road, Charlotte, NC 28217; Telephone: (800) 421-8661, (704) 522-0825; Fax: (704) 527-8232; E-mail: [productinfo@chemspec.com](mailto:productinfo@chemspec.com); Web site: [www.treatedwood.com](http://www.treatedwood.com).
  - c. Manufacturer: Arch Wood Protection.
    - 1) Dricon Fire Retardant Wood (FRT)

- 2) Contact: 1955 Lake Park Drive, Suite 100, Smyrna, GA 30080, Telephone:  
(770) 801-6600; Fax: (770) 801-1990. Web site:  
[www.wolmanizedwood.com](http://www.wolmanizedwood.com).

d. Or approved equal.

6. Warranty: Provide a 40-year roof warranty against heat degradation or approved equal for a period of 40 years commencing on Date of Substantial Completion.

## **2.6 MISCELLANEOUS LUMBER**

- A. Provide miscellaneous fire-retardant treated wood / lumber (FRTW) for support or attachment of other construction, including the following:
1. Rooftop equipment bases and support curbs concealed from weather.
  2. Blocking concealed from weather.
  3. Cants concealed from weather.
  4. Nailers concealed from weather.
  5. Furring concealed from weather.
  6. Grounds concealed from weather.
- B. For items of dimension lumber size, provide No. 2 grade lumber and better with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade and better; SPIB.
  2. Western woods, No. 2 Common grade and better; WWPA.
- D. Exterior Applications - Provide treated wood for exterior applications where wood is in direct contact with ground surface.
1. Provide pressure treated wood with an AWWA-U1 Use category rating;
    - a. Use Category UC3b for exterior construction not in contact with ground,\;
    - b. Use Category UC4A Ground Contact / General Use – freshwater contact.
  2. Douglas Fir or Southern Yellow Pine #2 or better.

## **2.7 PLYWOOD BACKING PANELS**

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated wood (FRTW), in thickness indicated to meet local code requirements or, if not indicated, not less than 3/4" inch thick. Product shall meet the flame and smoke spread rating requirements of the code and the building construction classification. Mounting Boards to be installed floor to ceiling and corner to corner within room, unless obstructions exist within the space.

## **2.8 MISCELLANEOUS MATERIALS**

- A. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A653/A 653M, G90 coating designation for lumber without chemical treatment, or 316L Stainless Steel or better when in contact with chemically treated lumber.

1. Acceptable Manufacturers:
    - a. Simpson Strong-Tie Company, Inc.
    - b. Alpine Engineered Products, Inc.
    - c. Cleveland Steel Specialty Co.
    - d. Southeastern Metals Manufacturing Co., Inc.
    - e. USP / Mitek Industries, Inc.
    - f. Or approved equal
  2. Research / Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
  3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. **Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 30 asphalt felt), un-perforated. Where all chemically treated lumber and fire-retardant treated lumber is in contact with metal deck, metal framing, and iron work including metal plates or structural shapes provide a continuous barrier separation using a layer of #30 building paper or layer of self-adhesive backed EPDM membrane or approved equal.**
- C. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.
- D. Adhesives for Field Gluing Panels to Framing: Formulation that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which materials in this section are to be installed. Coordinate with the General Contractor and confirm conditions are satisfactory in writing, with copies to the Owner's Representative and Architect, identifying any conditions detrimental to the proper and timely installation of the work that require correction. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer / Contractor.
- B. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner's Representative and Architect. Failure to submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.

### **3.2 PREPARATION**

- A. Coordinate installation of rough carpentry members specified in other sections.

### **3.3 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including shims, bracing, and blocking.
- C. Where FRTW is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
- D. Separate all FRTW from metal surfaces by providing separation from metal surfaces using build-up paper or EPDM membrane between surfaces.

### **3.4 FIRE RETARDANT TREATED WOOD (FRTW)**

- A. Fire retardant treated wood (FRTW) used in structural applications shall be installed in accordance with the conditions and limitations listed in ESR-1791 as issued by the ICC Evaluation Service, Inc.
- B. Fire retardant treated wood (FRTW) shall be installed in compliance with the requirements of the applicable building codes and product recommendations.
- C. Fire retardant treated wood (FRTW) shall not be installed in areas where in service it is exposed to precipitation, direct wetting, or condensation.
- D. As with untreated wood, avoid exposure to precipitation during shipping, storage or installation.
- E. Apply a water resistive barrier or underlayment over dry FRTW products and sheathing as soon as practical to avoid precipitation on the panel.
- F. Panels that get wet should be allowed to dry before covering. If wood becomes damaged from moisture, or lack of protection, then replace the FRTW products in their entirety.

### **3.5 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and FRTW blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous FRTW blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide FRTW blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened into two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide FRTW blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

### **3.6 ROOF-RELATED CARPENTRY**

- A. Refer to DIVISION 07 EPDM Membrane Roofing specification for more information.
- B. Utilize FRTW products for all roof carpentry that will be protected by roofing membrane, metal flashing, or roof edge system.
- C. Coordinate installation of FRTW roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- D. Provide FRTW curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

- E. Protect and cover FRTW roof blocking to prevent damage from moisture and the weather by using tarps or EPDM roofing material. Install finish wrap and metal covering as soon as possible to minimize exposure to the weather and elements.
- F. Provide separation of all fire-retardant treated wood nailers and existing treated blocking from all metal surfaces and materials. Use #30 building felt or self-adhesive EPDM flashing membrane as a separation sheet or approved equal.
- G. Surface Preparation:
  - 1. Clean substrate of projections and substances detrimental to roofing installation. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.
  - 2. Install cant strips and similar accessories as recommended by roofing systems manufacturer.
  - 3. Install nailers at perimeter of entire roof and around penetrations.
  - 4. Inspect existing nailers prior to the start of work. Determine which nailers must be removed. Replace with FRTW nailers. Refasten all existing nailers to existing structure or steel angles.
  - 5. Anchor bottom nailers (existing or new) to steel angles at minimum 4 feet on center or closer as required to comply with FM 1-49 recommendations. Attach subsequent nailers to bottom nailer with fasteners penetrating at least 1-1/4 inches in 2 staggered rows spaced not less than 24 inches on center with minimum 12 inches from outside corners, each way, unless otherwise required to resist min. 100 lbs. per fastener withdrawal force in any direction or comply with FM 1-49 recommendations. Provide 1/2" vent space between each length of nailer. All fasteners are to be counter sunk to allow installation of subsequent construction.
  - 6. Power-actuated fasteners (PAF) acceptable provided that shank is minimum 0.14-inch diameter and fastener equipped with minimum 7/8 in. diameter washers. Space PAF maximum 2 ft. o.c. unless closer spacing as required to comply with requirements specified above.
  - 7. Provide 316 stainless steel fasteners or better when in contact with fire retardant treated wood.
  - 8. Provide separation of all fire-retardant treated wood nailers and existing treated blocking from all metal surfaces and materials. Use #30 building felt or self-adhesive EPDM flashing membrane as a separation sheet or approved equal.

### **3.7 INSTALLATION OF CONSTRUCTION PANELS**

- A. Communications and Electrical Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  - 3. Install adjacent boards without gaps.
  - 4. Size and Location: As indicated on drawings.

### **3.8 SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment compatible with factory applied FRTW treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

### **3.9 CLEANING**

- A. Waste Disposal: Comply with the requirements of DIVISION 01.
  - 1. Recycle waste products where possible.
  - 2. Comply with the local jurisdictions recycling program and waste management requirements.
  - 3. Comply with applicable regulations.
  - 4. Do not burn scrap wood at the project location.
  - 5. Do not burn scraps that have been treated with chemical treatment.
  - 6. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.
- D. Dispose of all waste legally and in accordance with local jurisdiction requirements.

END OF SECTION 061000

## **SECTION 072100 - THERMAL INSULATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
  - 1. Batt insulation.
  - 2. Board Insulation for walls
  - 3. Concealed building sound retardant batt insulation and semi-rigid batt insulation where indicated for noise control.
  - 4. Spray foam or Batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof, filling of voids and penetrations.
  - 5. Below Slab Vapor Retarder
- B. Accessories for building insulation include but are not limited to the following:
  - 1. Adhesive for bonding insulation.
  - 2. Mechanical anchors.
- C. Related Sections:
  - 1. Division 01 – Front End Specifications
  - 2. Division 03 – Cast in Place Concrete
  - 3. Division 06 – Rough Carpentry
  - 4. Division 07 – Firestop Systems
  - 5. Division 09 – Gypsum Board Assemblies
  - 6. Division 09 – Acoustical Panel Ceilings

#### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - 2. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2007.
  - 3. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
  - 4. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006
  - 5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
  - 6. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.
  - 7. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.
  - 8. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

#### **1.3 SUBMITTALS**



- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01, SUBMITTALS and as modified below:
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: Provide data on product characteristics, performance criteria, and product limitations for each product indicated.
  - 2. Product test reports.
  - 3. Research / evaluation reports.
  - 4. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
  - 5. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Contract Closeout Submittals: Comply with Division 1 specifications and MNR "Terms and Conditions".

#### **1.4 QUALITY ASSURANCE**

- A. Single Source Responsibility: Furnish each insulation type from one manufacturer for entire Project, unless otherwise acceptable to Architect.
- B. Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75°F) per inch thickness specified for each material. Provide adjusted thicknesses for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value
- C. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
- D. American Society for Testing and Materials (ASTM).
- E. Federal Specifications (FS).

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Delivery, Storage and Protection: Comply with Division 01.
  - 1. Identify products with appropriate markings of applicable testing and inspecting organization.
  - 2. Deliver insulation to project site in manufacturer's original containers indicating thickness, type, fire, acoustical and thermal characteristics of material being supplied.
  - 3. Storage: Store insulation delivered to Site off ground or floor slab and fully protected from damage, weather, and ground water at all times. Provide under cover at all times.
  - 4. Protection from Deterioration: Do not allow insulation materials to become wet or soiled or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation. Protect plastic insulation from exposure to sunlight.

5. Fire Hazard Protection: Do not deliver plastic insulation materials to Site ahead of time of installation. Protect at all times against ignition. Complete installation and concealment of plastic materials as rapidly as possible in each area.
6. Mold Prevention:
  - a. Protect insulation products from exposure to moisture.

## **1.6 PROJECT CONDITIONS**

- A. Mold Prevention: Provide temporary heating and ventilation as required to keep insulation products dry during construction operations.

## **1.7 SEQUENCING**

- A. Schedule and sequence work to protect products from exposure to moisture and mold growth.

## **PART 2 - PRODUCTS**

### **2.1 INSULATING MATERIALS**

- A. General: Provide insulating materials that comply with requirements and with referenced standards and, for preformed units, in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Insulation Materials: Use of chlorofluorocarbons (CFCs) not allowed.
- C. Glass-Fiber Batt Insulation:
  1. Unfaced, Flexible Glass-Fiber Batt Insulation: ASTM C665, type I; with maximum flame-spread and smoke developed indices of 25 and 50, per ASTM E84. Formaldehyde-Free product, approx. 50% recycled content, Greenguard compliant.
  2. Manufacturers: As a basis of design, details and specifications have been based on following products:
    - a. Un-Faced blanket Insulation: (Blankets without membrane facing)
      - 1) "Ecotouch Pink Fiberglas Insulation with PureFiber technology": by Owens-Corning Fiberglass Corp. Toledo, Ohio.
      - 2) "Thermal-SHIELD Free Formaldehyde-Free, Unfaced Fiber Glass Thermal Insulation" by Johns Manville Insulations, Commercial Division.
      - 3) "Commercial Blanket Insulation" by Certain-Teed Corp., Valley Forge, Pennsylvania.
      - 4) Or approved equal.
- D. Sound-Control Blankets: Glass fibers and resinous binders formed into un-faced flexible blankets; complying with requirements of ASTM C 665 for Type I insulation and following:
  1. Flame spread (ASTM E84): less than 75
  2. UL listed
  3. Manufacturers: As a basis of design, details and specifications have been based on following products:
    - a. Sound-Control Blanket:
      - 1) "Sound Attenuation Batts Fiber Glass" by Owens Fiberglass Corp., Toledo, Ohio
      - 2) "Sound Control Batts" by Johns Manville Corp.,

- 3) "CentraPro AcoustaTherm Batts" by Certain-Teed Corp., Valley Forge, Pennsylvania.
  - 4) Or approved equal.
- E. Mineral-fiber blanket insulation consisting of fibers manufactured from slag or rock wool:
1. Utilize in fire rated applications, at wall penetrations, top of wall terminations, floor penetrations or where required by code to maintain rating.
  2. Similar to "Therma Fiber Fire Blankets" or "Therma Fiber Safing Insulation" by Certainteed or approved equal.
    - a. Utilize for rated wall applications in accordance with the UL or Gypsum Association test rating assembly requirements. Product is to be un-faced in thicknesses required for the job conditions. Install in accordance with the manufacturer's installation requirements to meet the UL or Gypsum Association test rating assembly requirements.
    - b. NFPA 220 non-combustible product.
    - c. ASTM C665 and ASTM E814 tested.
- F. Rigid Fiberglass Blankets: (For use at concealed spaces above ceiling)
1. As a basis of design, details and specifications have been based on following products: Johns Manville Linacoustic R-300 or approved equal.
  2. Alternatives may be accepted subject to compliance review.
  3. Properties:
    - a. NRC .9
    - b. R-Value: 6.3 @ (1.5" thick)
    - c. ASTM C1071 Type II compliant
    - d. Greenguard certified.
    - e. Max flame spread index: 25
    - f. Max smoke developed index: 50
    - g. Fungi resistance: ASTM C1338 compliant
    - h. Bacteria resistance: ASTM G22 compliant
- G. Rigid Board Insulation:
1. Below Slab Occupied Staff Areas - Extruded-Polystyrene Board Insulation:  
ASTM C 578, Type IV with maximum flame-spread and smoke-developed indices of 75 and 450, respectively. Comply with ASTM E84 and UL listed and following properties:
    - a. Thermal resistance (R) at 75 deg. with 90% lifetime limited warranty on thermal resistance for 1-inch thickness: 5.0 value minimum.
    - b. Blowing agent formulation: Shall be zero ozone depleting
    - c. Indoor Air Quality: Compliance certified by independent third party such as GREENGUARD Indoor Air Quality Certified® and/or GREENGUARD Children and Schools Certified<sup>SM</sup>.
    - d. Recycle Content: Minimum 20%, certified by independent third party such as Scientific Certification Systems
    - e. Compressive resistance at 10 percent deformation or yield: 25.0 psi minimum.
    - f. Density: 2.0 lb/cu. ft. minimum.
    - g. Water Absorption: Max .3% by volume
    - h. Flame spread (ASTM E84): less than 75.
    - i. Smoke Developed Index(ASTM E84): 450 or less
    - j. Fuel contributed (ASTM E 84): less than 100.

- k. UL listed.
  - l. Board Size: 24" x 96" inch at perimeter below the slab.
  - m. Board Thickness: 2", unless otherwise indicated on drawings.
  - n. Board Edges: Square edge.
  - o. Board Density: 1.55 lb/cu ft
  - p. Thermal Conductivity (k factor) at 40 degrees F (5 degrees C): 0.18
  - q. Warranty: Limited lifetime warranty covering all ASTM C578 physical properties
2. Manufacturers: As a Basis of design, details and specifications have been based on the following products:
- a. Extruded Polystyrene Insulation at Staff Areas:
    - 1) "Formular 250" by Owens-corning Corp., Toledo, Ohio.  
Other acceptable manufacturers upon compliance review include:
      - a) "Styrofoam Brand Square Edge" by Dow Chemical Co., Midland, Michigan
      - b) Pactiv Building Products Division – Green guard.
      - c) Or approved equal.

H. Cavity Wall Insulation:

- 1. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X with maximum flame-spread and smoke-developed indices of 75 and 450, respectively. Comply with ASTM E84 and UL listed and the following properties:
  - a. Thermal resistance (R) at 75 deg. with 90% lifetime limited warranty on thermal resistance for 1-inch thickness: 5.0 value minimum.
  - b. Blowing agent formulation: Shall be zero ozone depleting
  - c. Indoor Air Quality: Compliance certified by independent third party such as GREENGUARD Indoor Air Quality Certified<sup>®</sup> and/or GREENGUARD Children and Schools Certified<sup>SM</sup>
  - d. Recycle Content: Minimum 20%, certified by independent third party such as Scientific Certification Systems
  - e. Compressive resistance at 10 percent deformation or yield: 15.0 psi minimum.
  - f. Density: 2.0 lb/cu. ft. min.
  - g. Water Absorption: Max .3% by volume
  - h. Flame spread (ASTM E84): less than 75.
  - i. Smoke Developed Index(ASTM E84): 450 or less
  - j. Fuel contributed (ASTM E 84): less than 100.
  - k. UL listed.
  - l. Board Size: 16" x 96" or as otherwise required to fit spacing of framing members or masonry ties.
  - m. Board Thickness: 2 inches, unless otherwise indicated on drawings.
  - n. Board Edges: Square edge.
  - o. Board Density: 1.3 lb/cu ft
  - p. Thermal Conductivity (k factor) at 40 degrees F (5 degrees C): 0.18
- 2. Manufacturers - As a Basis of design, details and specifications have been based on the following products:
  - a. Extruded Polystyrene Insulation:
    - 1) Styrofoam Cavitymate Plus" by Dow Chemical co., Midland, Michigan
    - 2) Other acceptable manufacturers upon compliance review include:

- a) Foamular CW15” by Owens-corning Corp., Toledo, Ohio.
- b) Pactiv Building Products Division – Green guard.

## **2.2 AUXILIARY INSULATING MATERIALS**

- A. Spray Applied Filler Foam Products, include but are not limited to the following:
  - 1. Provide general use spray foam to restrict air infiltration and create water resistant seal at non-fire-rated, non-structural uses including:
    - a. Pipe/cable/HVAC penetrations and electrical junction boxes, blank openings, gaps and cracks, metal decking seams, base plate cracks, concrete formwork, general insulating.
    - c. Product complies with Air Leakage in accordance with ASTM E 283 and Pressure Build in accordance with AAMA 812-04.
    - d. Temperature performance of product allows it to be applied in extreme conditions ranging from 32-95 degrees Fahrenheit.
    - e. Identifiable orange color, with dispensers to allow precision installation with minimal waste.
    - f. Product provides an excellent sound barrier, with high-quality valve limits pressure loss, prolongs shelf life and minimizes waste.
    - g. Product contains no CFCs.
    - h. The product shall be VOC compliant.
      - 1) As a basis of design provide product similar to: CF-AS CJP All Seasons Crack and Joint Insulating Foam, by Hilti or approved equal.
  - 2. Low Pressure Filler Foam around the perimeter openings of window, door frames, and general openings (tested in accordance with AAMA 812). Product for reducing air, sound, dirt, and water infiltration. Complies with ASTM C 1620, for foam sealants.
    - a. CF-AS CJP All Seasons Crack & Joint Insulating Foam
    - b. Provide Low Pressure Filler Foam around the perimeter openings of window, door frames, and general openings (tested in accordance with AAMA 812). Product for reducing air, sound, dirt, and water infiltration. Complies with ASTM C 1620, for foam sealants.
    - c. The product shall be VOC compliant.
    - d. The product shall not contain formaldehyde.
      - 1) As a basis of design provide product similar to: CF 812 Window & Door Pro, by Hilti or approved equal.
- B. Adhesive for Bonding Insulation @ Cavity Walls: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates. As recommended by Insulation Manufacturer complying with fire resistance requirement.
- C. Utilize Manufacturer’s recommended tape to seal all joints between boards, panels, and batts.
- D. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application shown and appropriate for site conditions and substrate.
  - 1. Cavity wall: Utilize anchor plates with wall reinforcing as supplement to adhesive.

## **2.3 VAPOR BARRIERS & RETARDERS**

- A. Vapor Barrier below slab on grade must have the following qualities:
  - 1. Permeance:                   ASTM E 1249           0.012 perms or lower

2. Water Vapor Barrier: ASTM E 1745 Meets Class A (Plastics)
3. The vapor barrier membrane shall have a water-vapor transmission rate no greater than 0.01 gr./ft<sup>2</sup>/hr/inch Hg when tested in accordance with ASTM E96. The vapor barrier shall be placed over prepared base material where indicated below slabs on grade. Vapor barrier shall be no less than 15 mil thick. Installation of vapor barrier to comply with ASTM E1643.

Vapor Barrier: Provide the following products if not specified in Cast in Place Concrete.

4. As a basis of design, details and specifications have been based on following products or approved equal:
  - a. Stego Wrap (15 mil) Vapor Barrier by Stego Industries LLC
  - b. Pre-moulded Membrane with PLASMATIC CORE by W.R. Meadows
  - c. Zero Perm by Alumiseal
  - d. VaporBlock (15 mil) by Raven Industries
  - e. Or approved equal.
  - f. Refer to Division 03 – Cast In Place Concrete.

**B. ACCESSORIES**

1. Seam Tape
  - a. Tape must have the following qualities:
    - 1) Water Vapor Transmission Rate ASTM E 1249, 0.3 perms or lower
  - b. Seam Tape:
    - 1) Similar to Stego Tape by Stego Industries LLC, San Juan Capistrano, CA (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com) or approved equal.
2. Vapor Proofing Mastic:
  - a. Mastic must have the following qualities:
    - 1) Water Vapor Transmission Rate ASTM E 1249, 0.3 perms or lower
  - b. Mastic:
    - 1) Similar to Stego Mastic by Stego Industries LLC, San Juan Capistrano, CA (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com) or approved equal.
3. Pipe Boots:
  - a. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

**C. PREPARATION**

1. Ensure that subsoil is approved by geotechnical firm.
2. Level and tamp or roll aggregate, sand or tamped earth base.

**D. INSTALLATION**

1. Install Vapor Barrier/Retarder:
  - a. Installation shall be in accordance with manufacturer's instructions.
  - b. Lap Vapor Barrier/Retarder over thru wall flashing, footings, or seal to foundation walls based on details and conditions encountered. Comply with manufacturer's warranty requirements.
  - c. Overlap joints 6 inches and seal based on manufacturer's requirements.

- d. Seal all penetrations (including pipes) per manufacturer's instructions.
  - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities. Seal all penetrations using standard details.
  - f. Repair damaged areas by using patches provided by Vapor Barrier/Retarder manufacturer.
  - g. Coordinate installation of the system with adjacent systems including insulation system and waterproofing installations. Provide coordinated transition details with submittals.
- E. Vapor-Retarder Fasteners: Utilize product approved by vapor barrier manufacturer for fastening and seaming the system. Comply with manufacturer's installation requirements.
- F. Single-Component Non-sag Sealant: Utilize product approved by vapor barrier manufacturer for the system to seal around perimeter edges and terminations of dissimilar materials. Comply with manufacturer's installation requirements.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which products of this section are to be installed in coordination with Installer of materials and components specified in this Section and notify the General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions are acceptable to ensure proper and timely installation of the proposed products and confirms requirements for applicable warranty or guarantee can be satisfied; submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- 1. Verify that work of other trades which will be covered by insulation is complete, approved, and tested.
- C. Mold Prevention: Do not install wet insulation, insulation adjacent to wet materials, or insulation in wet conditions.
- D. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections, which might puncture vapor barriers.
- E. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- F. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

#### **3.2 INSTALLATION**

- A. General: Install insulation to comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement seal and tape butt joints.

- C. Installation of General Building Insulation: 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 to provide permanent placement and support of units.
- D. Installation at Metal Studs: Seal all voids and seams in walls with approved spray foam. Before installing vapor barrier, apply sealant to metal framing including runner tracks, metal studs, and framing around door and window openings.
  - 1. Install insulation or mineral-fiber blankets in cavities formed by framing members according to the following requirements:
    - a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    - b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 2. For metal-framed wall cavities where cavity heights exceed 96 inches support un-faced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
  - 3. Install board insulation on concrete substrates and water proofing products with approved adhesive or as required by the substrate manufacturer.
  - 4. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
  - 5. Fill voids at window openings with approved spray foam in accordance with manufacturer's instructions. Fill all voids and leave no air gaps.
  - 6. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.
  - 7. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown or required to make installation complete. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- E. Installation: Comply with manufacturer's requirements for all products and installation instructions to maintain warranty.

### **3.3 PROTECTION**

- A. Protect installed insulation and vapor barrier from harmful exposure and physical abuse until coverage by permanent concealing work. Advise Contractor of exposure hazards, including possible sources of deterioration and fire hazard.
- B. Dispose of all materials legally and in accordance with local jurisdiction requirements.
- C. Comply with recycling program and waste management procedures.
- D. Remove trash and construction debris from insulation surface prior to application of roofing membrane.
- E. Do not leave installed insulation exposed to weather. Cover and waterproof with completed roof system immediately after installation.
- F. Temporarily seal exposed insulation edges at the end of each day.
- G. Remove and replace installed insulation that has become wet or damaged with new insulation.
- H. Protect installed insulation and roof system at the end of each day and upon completion.
- I. Dispose of all waste legally and in accordance with local jurisdiction requirements.



- J. Comply with waste management and recycling program requirements.

END OF SECTION 072100

## **SECTION 072726 - FLUID-APPLIED AIR & WATER-RESISTIVE BARRIER SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY:**

##### **A. Section Includes:**

1. Masonry opening infill and application of a liquid applied air and water barrier membrane system (WRB), and accessory materials for application to existing exterior building envelope substrates.
2. Window and door flashing restoration, using a liquid applied air and water barrier membrane system, and accessory materials for application to existing exterior building envelope substrates.
3. Accessory materials to tie into adjacent existing materials.

##### **A. Related Requirements:**

1. Division 01 - Submittal Procedures.
2. Division 01 - Testing Laboratory Services.
3. Division 03 - Cast in Place Concrete.
4. Division 04 - Unit Masonry.
5. Division 07 - Thermal Insulation.
6. Division 07 - Sheet Metal and Flashing.
7. Division 08 – Insulated Translucent Fiberglass Sandwich Panel System.
8. Division 09 – Ceiling Systems

#### **1.2 REFERENCES**

- A. Living Building Challenge.
- B. ASTM International (ASTM).

#### **1.3 ADMINISTRATIVE REQUIREMENTS:**

- A. Pre-installation conference: Prior to beginning installation of the fluid applied rough opening system, hold a pre-installation conference to review work to be accomplished.
  1. Owner's Representative, Contractor, Architect, installing subcontractor, membrane system manufacturer's representative, roofing and foundation subcontractors, waterproofing subcontractors, and all subcontractors who have materials penetrating membrane system or finishes covering membrane system shall be present.
  2. Contractor shall notify Architect at least seven days prior to time for conference.
  3. Contractor shall record minutes of meeting and distribute to attending parties.
  4. Agenda: As a minimum discuss:
    - a. Surface preparation of restoration area and surrounding wall interfaces.
    - b. Existing substrate condition and pretreatment.
    - c. Minimum curing period.
    - d. Special details and/or sheet flashing for liquid applied rough opening installation.
    - e. Sequence of construction, responsibilities, and schedule for subsequent repair operations.
    - f. Installation procedures.
    - g. Inspection procedures.
    - h. Protection and repair procedures.
    - i. Review and approval of all glazing applications to include the installation of the windows and related interior perimeter sealant joint.

#### **1.4 PERFORMANCE REQUIREMENTS:**

- A. Performance requirements: Comply with the specified performance requirements and characteristics as herein specified.
- B. Performance description:
  - 1. Wall penetrations (windows, doors, etc.) shall be constructed with a continuous, air and water barrier to control water and air leakage into and out of the conditioned space around the existing / new window and door openings and infill areas.
  - 2. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
  - 3. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the rough openings and building envelope without damage or displacement.
  - 4. System shall be installed in an airtight and flexible manner, allowing for the relative movement of remediated systems due to thermal and moisture variations.
  - 5. Confirm existing conditions for tie in and variations that may be required to tie in the existing and new WRB systems.

#### **1.5 SUBMITTALS:**

- A. Product data: Submit manufacturer's product data and installation guidelines including membrane and accessory material types, technical and test data, composition, descriptions and properties, installation instructions and substrate preparation requirements.
- B. Certificates:
  - 1. Certificates by manufacturer stating that manufacturer and installer meet qualifications as herein specified.
- C. VOC Certification: Submit certification that products furnished comply with regulations controlling use of volatile organic compounds (VOC).

#### **1.4 QUALITY ASSURANCE:**

- A. Applicable standards, as referenced herein: ASTM International (ASTM).
- B. Manufacturer's qualifications: Air and water barrier systems shall be manufactured and marketed by a firm with an Air Barrier Association of America membership for at least five 5 years. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include certification of ABAA membership for a least five (5) years.
- C. Installer's qualifications: The installer shall demonstrate qualifications to perform the work of this section by submitting the following:
  - 1. Verification that installer has been trained by and is approved to perform work as herein specified by air and water barrier system manufacturer. Provide written confirmation the installers for this project have successfully completed manufacturer training using the systems specified.
  - 2. List of at least three (3) projects completed of similar scope and complexity to this project carried out by the firm and site supervisor over the past three (3) years.
- D. Inspection and testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover installed products or assemblies until they have been inspected, tested and approved.

- E. Sole source: Obtain materials within the scope of this specification from a single manufacturer.
- F. Regulations: Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOC).
- G. Mock-up:
  - 1. Prior to installation and start of Work of the fluid applied rough opening system a field-constructed mock-up shall be applied to verify details and tie-ins, to demonstrate the required installation.
    - a. Construct a typical exterior wall section, approximate dimensions of 8 feet long and 8 feet wide, incorporating backup wall, cladding, window, door frame, sill, penetrations, insulation, flashing and any other critical junction.
    - b. Include on masonry mock-up panel for review and inspection.
    - c. Allow 72 hours for inspection and testing of mock-up before proceeding with water and air barrier work.
    - d. Coordinate construction of mockups to permit inspection by Architect and Owner's Representative of air barrier before beginning installation.
    - e. Approved, undamaged mock-up must remain as part of the work.

#### **1.5 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. Protect air and water barrier components from freezing and extreme heat.
- C. Sequence deliveries to avoid delays, and to minimize on-site storage.

#### **1.6 FIELD CONDITIONS:**

- A. Environmental conditions:
  - 1. Comply with manufacturer's written instructions for substrate temperature and moisture content and other conditions affecting performance requirements.
- B. Weather conditions:
  - 1. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.
- C. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the membrane system.
- D. Ultra-violet Exposure:
  - 1. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer.

#### **1.7 WARRANTY:**

- A. Manufacturer's warranty requirements:
  - 1. Submit manufacturer's five (5) year limited warranty stating:

- a. The products have been tested in accordance with national standards for air and water-resistive barriers and passed those tests with effectiveness and durability indicating their suitability for performance as an air and water-resistive barrier system when properly applied.
- b. The products shall be free from defects in material for a period of [five] years after the substantial completion of the material application.
- c. That the products will not disintegrate and will maintain their integrity over the life of the warranty.

B. Warranty period: Five (5) years from Date of Substantial Completion.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As a basis of design, products have been specified around:
- B. PROSOCO, Inc, 3741 Greenway Circle, Lawrence, KS 66046. Phone (800) 255-4255; Fax: (800) 877-2700. E-mail: CustomerCare@prosoco.com
- C. Other manufacturers that may be acceptable upon compliance review include:
  1. Sto,
  2. Carlisle,
  3. Henry,
  4. Or Equal.

### **2.2 MATERIALS**

#### **A. LIQUID APPLIED FILL COAT AND SEAM FILLER**

1. High modulus, gun-grade, crack and joint filler, adhesive and detailing compound that combines the best silicone and polyurethane properties. The single-component, Silyl-Terminated-Polymer (STP) prepares open joints, seams and cracks before installing primary water and air barrier system to prevent the movement of water and air through building envelopes.
  - a. Product: PROSOCO R-Guard Joint & Seam Filler, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com) or approved equal.
2. Subject to compliance with the following physical and performance requirements:
  - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
  - b. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
  - c. Water vapor transmission: Minimum 19 perms at 20 mils when tested in accordance with ASTM E-96.
  - d. Tensile strength: 70 psi when tested in accordance with ASTM D412.
  - e. Elongation at break: Greater than 180 percent when tested in accordance with ASTM D412.
  - f. Peel strength: Greater than 25 pli when tested in accordance with ASTM D1781.
  - g. Total solids: 99 percent.

#### **B. LIQUID-APPLIED FLASHING AND DETAILING MEMBRANE**

1. Gun-grade, spread and tool or roller apply waterproofing, adhesive and detailing compound that combines the best of silicone and polyurethane properties. The single component, Silyl-Terminated-Polymer (STP) produces a highly durable, seamless, elastomeric flashing membrane in rough openings, to fill joints and seams, to counter flash and transition

waterproofing and air barrier components in new wall assemblies, and to seal around penetrations or protect countersunk fasteners.

- a. Product: PROSOCO R-Guard FastFlash manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com) or approved equal.
2. Subject to compliance with the following physical and performance requirements:
  - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
  - b. AAMA 714-12 Voluntary Specification for Liquid-Applied Flashing Used to Create a Water-Resistive Seal Around Exterior Wall Openings in Buildings.
  - c. ICC-ES AC 212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing.
  - d. Comply with national, state and district AIM VOC regulations and be 30 g/L or less.
  - e. Water vapor transmission: 21 perms when tested in accordance with ASTM E96.
  - f. Tensile strength: Greater than 150 psi when tested in accordance with ASTM D412.
  - g. Elongation at break: Greater than 350 percent when tested in accordance with ASTM D412.
  - h. Total Solids: 99 percent.

#### C. INTERIOR SEALANT FOR WINDOWS AND DOORS

1. High performance, gun-grade waterproofing sealant that combines the best of silicone and polyurethane properties. Single component, Silyl-Terminated-Polymer (STP) that is durable and stops the movement of moist air through cracks surrounding windows and doors.
  - a. Product: PROSOCO R-Guard AirDam, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, [www.prosoco.com](http://www.prosoco.com) or approved equal.
2. Subject to compliance with the following physical and performance requirements:
  - a. Living Building Challenge 2.0/2.1/3.0/3.1 Red List.
  - b. Comply with national, state and district AIM VOC: less than 30 grams per Liter
  - c. Sealant Validation from Sealant Waterproofing & Restoration Institute (SWRI).
  - d. Elongation at break: Greater than 1000 percent when tested in accordance with ASTM D412.
  - e. Peel strength: 25 pli when tested in accordance with ASTM C794
  - f. Total solids: 98 percent.
3. Backer rod: In deep joints, control sealant depth by installing closed cell backer rod. Diameter of the soft-backer rod should be 25 percent greater than the joint width. Do not puncture backer rod.

#### D. FLUID-APPLIED AIR & WATER-RESISTIVE BARRIER

1. Provide a fluid applied air and water-resistive barrier that stops air and water leakage in cavity wall, masonry veneer construction and other building wall assemblies.
2. The easily applied liquid quickly dries into a rubberized, highly durable, water-resistant, vapor-permeable membrane.
3. The system provides superior protection against water intrusion while minimizing potential for condensation within walls and allowing accumulated moisture to dry while reducing energy costs and lowering the risk of mold and mildew.
4. The durable membrane conforms and adheres to common building surfaces and is compatible with most paints, sealants and self-adhered waterproofing or air barrier components.
5. Use as a high-performing water-resistive barrier or as part of a continuous, building-wide air barrier system.
6. Appropriate for vertical, above-grade applications to exterior sheathing, CMU, cast concrete and most other common building materials.
  - a. Product: PROSOCO R-Guard® Spray Wrap MVP by PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046 or approved equal.

- b. Phone: (800) 255-4255; Fax: (785) 830-9797.
  - c. E-mail: [CustomerCare@prosoco.com](mailto:CustomerCare@prosoco.com)
  - d. Technical Data:
    - 1) Form: batter like semi-gel liquid, pink color
    - 2) Specific Gravity: 1.26
    - 3) pH: 8.5 to 9.5
    - 4) Weight/Gallon: 11.69 pounds
    - 5) Active Content: no data
    - 6) Total Solids: 63 to 68 percent
    - 7) VOC Content: less than 18 grams per Liter. Complies with all known national, state and district AIM VOC regulations.
    - 8) Flash Point: not applicable
    - 9) Freeze Point: 32 degrees Fahrenheit (0 degrees Celsius)
    - 10) Shelf Life: 2 years in tightly sealed, unopened container
7. Limitations:
- a. Do not apply when surface or air temperatures are below 25 degrees Fahrenheit (-3 degrees Celsius) or above 100 degrees Fahrenheit (38 degrees Celsius).
  - b. Not for application below-grade or in locations designed to be continuously immersed in water.
  - c. Do not use product as an exterior finish.

#### E. ACCESSORIES

- 1. Stainless Steel Thru Wall Flashing System for head, sill and base of wall.
  - a. Product: PROSOCO R-Guard<sup>®</sup> SS Thru Wall System by PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046 or approved equal.
  - b. Technical Data:
    - 1) Form - stainless steel sheet with polypropylene coating, silver/gray color
    - 2) Material – Type 316 SS Thru Wall
    - 3) Thickness – 7 mils min
    - 4) Specific Gravity – 8.8 – 8.9
    - 5) VOC Content – NA
    - 6) Shelf Life - NA
    - 7) Made of 60% recycled material – and recyclable itself.
    - 8) Non-staining – appropriate for use with limestone.
    - 9) Superior puncture resistance and tensile strength.
    - 10) Flexible and easy to cut and form by hand.
    - 11) Fire resistant – ASTM E 84 tested, Class A material.
    - 12) Mold resistant – ASTM D 3273 tested.
    - 13) Will not degrade in high temperature application.
    - 14) Roll product in a minimum of 60-foot rolls in 12-inch, 18-inch, 24-inch, or 36-inch sizes
- 2. Provide system components to make the work complete including:
  - a. Prefabricated components with termination bar, drip edge with hemmed edge, stainless-steel end dams, inside corners, and outside corners with hemmed edges made of 26-gauge 316 stainless steel.
  - b. Weep vents and other system components shall be provided and coordinated with products specified in Division 04 – Unit Masonry.
  - c. Install all products in accordance with manufacturers installation instructions.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION AND SURFACE PREPARATION**

- A. Examine conditions for compliance with system manufacturer's requirements for installation, and other specific conditions affecting performance of air and water barrier system.
- B. All surfaces must be sound, clean and free of grease, dirt, excess mortar or other contaminants. Fill or bridge damaged surfaces, voids or gaps larger than one- inch. Fill voids and gaps measuring one- inch or less with liquid applied fill coat and seam filler as necessary to ensure continuity.
  - 1. Surfaces to receive STP) fluid applied accessories must be dry, damp or wet to the touch. Brush away any standing water present before application. The products will tolerate rain immediately after application.
- C. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
  - 1. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
  - 2. Remove contaminants such as grease, oil and wax from exposed surfaces.
  - 3. Remove dust, dirt, loose stone and debris.
  - 4. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
  - 5. Refer to manufacturer's product data sheets and manufacturer's installation guidelines for additional information on preparing structural walls to receive the primary air and water resistive barrier.
- D. Masonry and concrete substrates:
  - 1. Masonry head and bed joints should be fully filled and tooled.
  - 2. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and debris.
  - 3. Fill cracks, joints and gaps with liquid applied fill coat and seam filler as herein specified.

### **3.2 FLUID-APPLIED AIR & WATER-RESISTIVE BARRIER**

- A. Application of WRB: CMU Wall Construction
  - 1. Apply sufficient WRB to fill and cover the entire face of the exterior wall assembly. Let dry.
  - 2. Apply a second coat to achieve hide. The finished application must be continuous and free of voids and pinholes. Back rolling spray applications is necessary to maximize coverage for a void- and pinhole-free surface. Take special care to achieve full coverage around wall ties or surface irregularities.
  - 3. Inspect membrane before covering. Repair any deep gouges, punctures or damaged areas with Joint & Seam Filler. If the surface of the primary air barrier or liquid flashing membrane is damaged during construction, remove all loose surface contaminants before selective recoating with additional repair materials. Overlap repairs, penetration treatments, transitions, rigid flashing and other air barrier components to ensure positive drainage and continuity of the air and water-resistive barrier.
- B. Transitions:
  - 1. Infill transitions between existing and new materials in accordance with manufacturers detailing requirements to maintain continuity of the system and maintain the warranty.
  - 2. Transition between thru wall flashing and WRB to maintain system continuity. Ensure compatibility between WRB and flashing system prior to installation.



- C. Curing and Drying
  1. Curing and drying times vary with temperature, humidity and surface conditions. Protect from rain until completely cured. Surface temperatures should remain at least 25 degrees Fahrenheit (-3 degrees Celsius) and rising after application and until curing is complete. WRB dries to the touch in 1 hour and can be re-coated in 2 hours. Product drying time is 12 hours at 70 degrees Fahrenheit (21 degrees Celsius) and 50 percent relative humidity.
- D. Coverage
  1. Coverage rates may vary depending on surface porosity, moisture uptake and other factors. Actual rates must be determined through mock-up applications.
  2. CMU: 30 to 60 square feet per gallon per coat. Two-coat minimum required to achieve a pinhole free surface.
- E. Cleanup
  1. Clean tools and equipment with soapy water immediately after use. Dried material must be removed mechanically.

### **3.3 FIBER REINFORCED FILL COAT AND SEAM FILLER**

- A. General: Comply with air and water barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid applied fill coat and seam filler for seams, joints, cracks, gaps, primed rough gypsum edges at sheathing, and rough openings per manufacturer's written instructions.

### **3.4 LIQUID APPLIED FLASHING AT OPENINGS & PENETRATIONS**

- A. General: Comply with air and water barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply liquid flashing membrane to seal and waterproof rough openings per manufacturer's written instructions. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply additional coats as needed to achieve void- and pinhole-free surface.

### **3.5 FLUID-APPLIED FLASHING TRANSITIONS**

- A. General: Comply with water and air barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply fiber reinforced fill coat and seam filler and liquid flashing membrane as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials per manufacturer's written instructions.
  1. Fill any voids between the top of the flashing leg and the vertical wall with fiber reinforced fill coat and seam filler.
  2. Spread the wet liquid flashing membrane to create a monolithic "cap-flash" flashing membrane per manufacturer's written instructions.
  3. Apply additional coats as needed to achieve void- and pinhole-free surface.
  4. Allow treated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.

### **3.6 INTERIOR SEALANT FOR WINDOWS AND DOORS INSTALLATION**

- A. General: Comply with air and water barrier manufacturer's installation instructions, temperature limitations, product data and shop drawings.
- B. Apply interior waterproofing sealant per manufacturer's written instructions.
  - 1. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Install Backer Rod as necessary per manufacturer's written instructions.
  - 2. Apply interior waterproofing sealant in continuous beads without gaps or air pockets.

### **3.7 PROTECTION**

- A. Coordinate scheduling within installation of cover materials to ensure that fluid-applied air barrier system is not exposed to sunlight and weather longer than recommended by the system manufacturer.
- B. Ensure that the top edge of the fluid-applied membrane and the existing air barrier system is sealed and protected from water intrusion. Ensure the continuity of the fluid-applied air barrier system has been achieved.

END OF SECTION 072726

## **SECTION 075500 - MODIFIED BITUMINOUS ROOFING**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes, but is not limited to the following:
1. Asphaltic modified bituminous roofing
  2. Insulation
  3. Maintain existing roof system warranty currently in place. Utilize certified contractor to perform the work to maintain the warranty.
- B. Related Sections:
1. Division 05: Metal Fabrications
  2. Division 06: Rough Carpentry
  3. Division 07: Sheet Metal Flashing and Trim
  4. Division 07: Roof Accessories
  5. MECHANICAL DIVISION - Heating Work
  6. ELECTRICAL DIVISION - Electric Work
  7. MECHANICAL DIVISION - Plumbing Work

#### **1.02 REFERENCES**

- A. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*
1. ASTM C 208 - Standard Specification for Cellulose Fiber Insulating Board.
  2. ASTM C 728 - Standard Specification for Perlite Thermal Insulation Board.
  3. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  4. ASTM C 1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emission meters.
  5. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
  6. ASTM C 1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emission meters.
  7. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp-proofing and Waterproofing.
  8. ASTM D 312 - Standard Specification for Asphalt Used in Roofing.
  9. ASTM D 1863 - Standard Specification for Mineral Aggregate Used on Built-Up Roofs.
  10. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
  11. ASTM D 3672 - Specification for Venting Asphalt-Saturated and Coated Inorganic Felt Base Sheet Used in Roofing.
  12. ASTM D 3909 - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules.
  13. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
  14. ASTM D 4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
  15. ASTM D 4897 - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing.
  16. ASTM D 6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

17. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
  18. ASTM D 6222 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
  19. ASTM E 903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres.
- B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - *Architectural Sheet Metal Manual*
- C. Asphalt Roofing Manufacturers Association (ARMA)
- D. National Roofing Contractors Association (NRCA)
- E. American Society of Civil Engineers (ASCE)
- F. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide

### **1.03 DEFINITIONS**

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

### **1.04 PERFORMANCE REQUIREMENTS**

- A. General: Provide installed roofing system and components including field, base flashings, and transitions that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure. All system components shall match the existing system materials and be in conformance with the existing roof warranty requirements of the roof manufacturer.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roof manufacturer based on testing and field experience.
- C. Provide an installed roofing membrane and base flashing system that does not permit the passage of water; and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
- D. The roofing manufacturer, warranty holder, (GAF) shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.
- E. Requirements for Design Uplift Pressures:
1. Comply with applicable requirements of the current New Jersey Uniform Construction Code including applicable International Building Code - New Jersey Edition. Refer to the Code Data Sheet.
  2. Repairs and Modifications to Match Existing Roof Systems in Place.
- F. Provide roofing system that complies with "Conditions of Classification" established by ASTM or UL for roof assembly.

### **1.05 SUBMITTALS**

- A. Product Data: Provide product data sheets for each type of product indicated in this section. Refer to contract documents for roof system drawings and details.
1. Products include:
    - a) Roof deck
    - b) Insulation
    - c) Cover board
    - d) Base sheet
    - e) Ply sheet
    - f) Surface membrane

- g) Flashing membrane
  - h) Accessories
- B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified and the conditions encountered in the field. System components shall be in conformance with and maintain the roof system warranty in place.
- 1. Perform a field inspection to confirm system components and details required prior to submission of the submittal package.
- C. Samples: Provide samples of insulation(s), fasteners, and roll goods for verification of quality.
- D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain and maintain the system warranty specified in this section.

## **1.06 WARRANTY AND INSPECTIONS**

- A. Warranty: Maintain the manufacturer's standard warranty current in effect for the project.
- 1. Current Warranty: Ruberoid® Diamond Pledge NDL Guarantee No. GEMA2367-1003.
    - a) Original term: Twenty (20) years
    - b) Issued 7/6/2006 and expires 4/21/2025
    - c) Repairs will not affect the existing guarantee coverage as long as current manufacturer's applications and specifications are followed and the guarantee procedures are met.
    - d) All wall and roof penetrations shall be flashed to maintain warranty.
    - e) Upon completion of repairs, the contractor must take photos of all modified roof areas showing details and submit to GAF Guarantee Services for a final acceptance of the details.
    - f) All work will be inspected as defined below in Warranty Inspections.
- B. Guarantee Re-Issuance: Roofing system manufacturer will re-inspect roof and re-issue guarantee, provided that methods and materials used in repair have received manufacturer's prior approval and repairs are performed by a manufacturer's certified, trained, and approved 20-year installer / applicator.
- C. Warranty Inspections:
- 1. The roof manufacturer shall perform an initial conditions assessment inspection for the entire roof of the building before the start of work with an approved (roof system manufacturers) certified inspector to catalogue the work areas that will be impacted and define the 20-year warranty work requirements for the roof system in place. The report shall also outline existing roof deficiencies that should be addressed outside of the primary work area of the roof improvements for this project. The roof manufacturer shall issue a field report of their findings and provide a copy of the field report directly to Architect and Owner within 3 days of the field inspection.
  - 2. The roof system manufacturers certified inspector shall perform a minimum of (1) one interim field inspection during the installation of work. Provide a copy of the manufacturer's field reports outlining the work and any deficiencies directly to Architect and Owner within 3 days of the field inspection.
  - 3. The roof system manufacturers certified inspector shall perform a minimum of (1) one final warranty inspection at the conclusion of work. Provide a copy of the manufacturer's field report directly to Architect and Owner within 3 days of the field inspection. The report will outline the work and any deficiencies requiring repairs.
  - 4. Roof manufacturer at the conclusion of work shall issue an updated 20-year warranty amendment in writing for the roof system on the building accepting all the work performed as part of the warranty.
  - 5. Contractor shall make any repairs necessary to obtain a final roof warranty amendment from the roof manufacturer.
    - a) Inspection Report: Provide a copy of roofing system manufacturer's inspection report of completed roofing installation work and any noted corrections. Report is to confirm the roof system as installed meets the warranty requirements. Submit report within 3 days of inspection to Architect and Owner.

### **1.07 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Roof manufacturer, (GAF) shall provide a roofing system that meets or exceeds all criteria listed in this section. All proposed products and system components shall match and maintain the existing roof system and warranty requirements currently in place.
- B. Installer's Qualifications:
1. Installer shall be certified / classified as a "Master" or "Master Select" contractor as defined and certified by the roof manufacturer (GAF).
  2. Submit with the bid and submittal written certification from the roof manufacturer that the installer is a trained / certified contractor.
  3. Roofing System Installer: Single firm specializing in the roof manufacturers 20-year roofing system on the building. (GAF). The roof contractor shall provide undivided responsibility for performance of all components parts of the roofing system (including all terminations and components covered under roofing manufacturer's guarantee but specified in other sections), and complying with following requirements:
    - a) Approved, in writing by roofing system manufacturer for installation of the roofing system, including field, flashings, details, transitions, and copings.
    - b) At least five (5) years of documented successful experience installing commercial-scale roofing systems and at least three (3) successful roofing systems installed with-in the most recent year. Be able to provide complete contact information, warranty history for these installations and demonstrate in-service performance.
    - c) Roofing Installation Foremen: Successfully completed all training offered by roofing system manufacturer, including school, seminars, and similar opportunities. Foreman is always to be on the job site while roofing work is in progress. Provide written certification from the roof manufacturer the assigned foreman has attended and passed recent training for the proposed roof system type for this project.
    - d) Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified to meet the project schedule and satisfy the warranty requirements. Provide written certification from the roof manufacturer the assigned tradesmen have attended and passed recent training for the proposed roof system type for this project.
- C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer. All proposed products and system components shall match and maintain the existing roof system and warranty requirements currently in place.

### **1.08 PRE-INSTALLATION CONFERENCE**

- A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, roof manufacturer (GAF) representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements); and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

### **1.09 REGULATORY REQUIREMENTS**

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

### **1.10 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry the roof manufacturers label (GAF).

- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Store roll goods on end on pallets in a clean, dry, protected area. Take care to prevent damage to roll ends or edges. Do not double stack modified bitumen products.
- D. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- E. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each workday. Do not remove any protective tarpaulins until immediately before the material is to be installed.
- F. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

#### **1.11 SEQUENCING AND SCHEDULING**

- A. Schedule and execute work to prevent leaks and excessive traffic over completed roof areas.
- B. Provide protection for the interior (and exterior) of the building and to ensure water does not flow beneath any completed sections of the roof system.
- C. Protect interior of building from demolition activities by using plastic sheeting to protect against falling debris and dust. Clean interior spaces daily.
- D. Do not proceed with roofing installation until substrate construction and penetrations have been complete and weather tight measures have been installed.
- E. Limit removal of existing roofing system to an amount of work that can be replaced with the new roofing system (including insulation, sheet membrane, flashing, and related construction) in single working day while maintaining watertight covering on roof.
  - 1. Temporary Waterstops: At end of each workday or when weather conditions outside manufacturer's recommended limits are predicted, install temporary waterstops recommended by roofing system manufacturer. In addition to daily terminations and at Architect's discretion, strip in newsheet membrane to existing roofing as recommended by roofing system manufacturer. Do not use permanent roof insulation as base for temporary waterstops. Completely remove temporary waterstops before installing permanent roofing system.
  - 2. Interface with Existing roofing: Where applicable, obtain approval of all materials and methods used in cutting, patching, repairing and connecting new membrane to existing sheet membrane from all parties holding roofing bonds, warranties, or guarantees in force. All work to comply with roofing manufacturer's warranty requirements.

#### **1.12 PROJECT CONDITIONS**

- A. Weather
  - 1. Proceed with roofing only when existing and forecasted weather conditions permit.
  - 2. Material Safety Data Sheets (MSDS) to be at the project site location at all times during the transportation, storage and application of materials.
- B. When loading materials onto the roof, the authorized roofing installer must comply with the requirements of the building Owner to prevent overloading and possible disturbance to the building structure.
- C. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, roof sections shall be protected and inspected upon completion for possible damage.
- D. Provide roof protection, such as ¾-inch thick plywood over suitable substrate such as protection pads or other approved material, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.
- E. Roofing work shall be complete and weather-tight at the end of the workday.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURER**

- A. GAF® - 1 Campus Drive, Parsippany, NJ 07054
  - 1. Or approved equal.
- B. General: all products and accessories shall conform to the roof manufacturer's warranty requirements. All systems shall match existing system components in size, shape profile, material type, thickness, quality, and finish, so they do not void the existing warranty currently in place.

### **2.02 INSULATION**

- A. Flat or Tapered Rigid polyisocyanurate board, with a strong white or black fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HH-I-1972. EnergyGuard Polyiso Insulation, with the following characteristics:
  - 1. Board Thickness: 2" or as required to match existing (Flat or Tapered)
  - 2. Thermal Resistance (LTTR value) of: R11.4
  - 3. Match existing thickness, pitch, system assembly, and configuration.
    - a) Or approved equal.
- B. Expanded perlite mineral aggregate board conforming to or exceeding the requirements of FS HH-I-529b, ANSI/ASTM C 728. EnergyGuard Perlite Recover Board, by BMCA with the following characteristics:
  - 1. Board Density: 9 lb./cu. ft. min.
  - 2. Board Thickness: ½"
  - 3. Thermal Resistance (R value) of: 1.32
  - 4. Match existing thickness, pitch, system assembly, and configuration.
    - a) Or approved equal.

### **2.03 INSULATION ACCESSORIES**

- A. Cant Strip: Factory fabricated rigid perlite strip cut at angles to provide a true 45° Angle between horizontal and vertical surfaces, EnergyGuard Perlite Cant Strip, by GAF.
  - 1. Match existing thickness, pitch, system assembly, and configuration.
    - a) Or approved equal.
- B. Tapered Edge Strip: Factory fabricated rigid perlite strip cut at angles to provide a smooth transition between differences in elevation. EnergyGuard Tapered Edge Strip, by GAF.
  - 1. Match existing thickness, pitch, system assembly, and configuration.
    - a) Or approved equal.

### **2.04 BASE / PLY SHEETS**

- A. Heavyweight asphalt coated glass fiber base sheet: Conforms to or exceeds requirements of ASTM D 4601, Type II, UL Type G2 BUR, and Federal Spec SS-R-620B Type II. Each roll contains three (3) squares (320 sq. ft.) of material, approximately 39.375" x 97.5' (1 m x 29.7 m); 68 lbs. (30.8 kg), GAFGLAS #75 base sheet.
  - 1. Or approved equal.
- B. Tough SBS modified asphalt glass reinforced base sheet: Each roll contains one and one-half squares of material, approximately 39.375" x 50.3' (1 m x 15.33 m); 89 lbs. (40.37 kg), Ruberoid 20 Smooth base / ply sheet.
  - 1. Or approved equal.



**2.05 MEMBRANE MATERIALS**

- A. Premium, heavy-duty, fire-retarding, granule-surfaced asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with flexible, SBS polymer-modified asphalt. Conforms to or exceeds requirements of ASTM D 6164 Type II Grade G. Each roll contains one square of material, approximately 39.625' x 32.56' (1 m x 9.92 m), 103.7 lbs. (47.03 kg), Ruberoid® Mop Plus Granule FR roof membrane.
1. Or approved equal.

**2.06 FLASHING MATERIALS**

- A. Tough SBS modified asphalt glass reinforced base sheet: Each roll contains one and one-half squares of material, approximately 39.375' x 50.3' (1 m x 15.33 m); 89 lbs. (40.37 kg), Ruberoid® 20 Smooth base / ply sheet.
1. Or approved equal.
- B. Premium, heavy-duty, fire-retarding, granule-surfaced asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with flexible, SBS polymer-modified asphalt. Conforms to or exceeds requirements of ASTM D 6164 Type II Grade G. Each roll contains one square of material, approximately 39.625' x 32.56' (1 m x 9.92 m), 103.7 lbs. (47.03 kg), Ruberoid Mop Plus Granule FR roof membrane.
1. Or approved equal.

**2.07 BITUMEN / ADHESIVES**

- A. SBS Cement: ASTM D 4586, Matrix 201 Premium SBS Flashing Cement, by GAF, or approved equal.
- B. Asphalt Primer: ASTM D 41 Matrix 307 Premium Asphalt Primer, by GAF, or approved equal.

**2.08 ACCESSORIES**

- A. Mechanical Fasteners
1. Drill•Tec Standard Roofing Fastener: Alloy steel fastener with CR-10 coating with a .220" diameter thread: Factory Mutual Standard 4470 Approved, #3 Phillips truss head or hex head, or approved equal.
  2. Drill•Tec 3" Galvalume® Plate: Galvalume, 3" (7.5 cm) diameter, center hole .25" (inch), for use with Standard, Heavy Duty, CD-10, Fluted Nail or Toggle Bolt. 3" flat plate shall be used to fasten Dens Deck or Securock Roof board in cold applied systems; or approved equal.
- B. Standard Vents
1. A spun aluminum vent, pre-flashed with modified bitumen designed to waterproof soil pipes and roofing protrusions. The Standard MVent, by MWeld, , or approved equal.
    - a) NOTE: Not for use over active pipes that emit steam or excessive moisture vapor, condensation may occur. Not for use over boiler or heater/furnace vent pipes.
- C. Adjustable Vents
1. A two-piece roof-flashing unit consisting of a pre-flashed spun aluminum base and a flexible upper boot, allowing for waterproofing of tall or awkward roof protrusions. The Adjustable MVent, by MWeld; or approved equal.
- D. Plumbing Vents
1. A pre-flashed with modified bitumen membrane and is designed to waterproof vent pipes. It can be used as a pipe cover to replace finger and cap flashing on standard vent pipe details. The Pre-Flashed Plumbing Vent, by MWeld; or approved equal.

- E. Drains
  - 1. A spun aluminum roof drain with gravel guard, strainer cap, and waterproofing plumbing seal attached. Pre-flashed with modified bitumen to accommodate retrofit applications. The MDrain, by MWeld; or approved equal. Match existing.
  - 2. A Pre-flashed metal through-wall roof drain designed for easy installation to aid in quick lateral removal of water. The Mscupper, by MWeld; or approved equal to match existing.
- F. Sealant Pans
  - 1. A structural urethane outer shell, bonded to the roof surface, filled with a urethane rubber sealant. The urethane sealant conforms to the shape of any roof penetration through a roof surface to protect the roof system from moisture. The M-Curb and M-Thane, by MWeld to match existing; or approved equal.
- G. Expansion Joint Covers
  - 1. Factory fabricated assemblies used to accommodate three-dimensional joints in a roof structure. Heavy reinforced flexible cover with a flexible flame-retardant foam bellows for support. Nailing flanges conform to curb irregularities. The Metalastic Expansion Joint Cover, by GAF to match existing; or approved equal.
- H. Gravel Guard
  - 1. Three-piece fascia system with roof flange design that creates water and wind proof seals at the building perimeter. The Gravel Guard MB, by GAF® to match existing; or approved equal.
- I. Snap-On Coping
  - 1. Factory fabricated coping system with min 20-gauge cleat. Available in 22 gauge and 24 gauge steel, as well as 0.32", .040", .050" and .063" aluminum. Available in factory Kynar finishes, M-Weld Snap-On Coping, by GAF to match existing; or approved equal.
    - a) Color: to match existing
- J. Fascia System
  - 1. Two-piece snap on fascia system with heavy duty extruded retainer. Features a wide base flange to securely hold down BUR and Modified Bitumen roofing plies. Available in gravel stop style and box style, M-Weld™ EZ Fascia EX/ M-Weld™ EZ Fascia EX Extender, by GAF to match existing; or approved equal.
    - a) Color: to match existing
- K. TOPCOAT® Flexseal
  - 1. Solvent-based synthetic elastomeric sealant to match existing; or approved equal.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which materials in this section are to be installed. Coordinate with the General Contractor and confirm conditions are satisfactory in writing, with copies to the Owner's Representative and Architect, identifying any conditions detrimental to the proper and timely installation of the work that require correction. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer / Contractor.
- B. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner's Representative and Architect. Failure to submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.
- C. Verify that the surfaces and site conditions are ready to receive work.

- D. Verify that the deck is supported and secured.
- E. Verify that the deck is cleaned and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- F. Verify that the deck surfaces are dry and free of ice or snow.
- G. Verify that all roof openings, curbs, pipes, sleeves, ducts, vents or other penetrations through the roof are solidly set, and that all flashings are tapered.

### **3.02 SUBSTRATE PREPARATION**

- A. Steel Deck
  - 1. Metal decks must be a minimum uncoated thickness of 22 gauge (0.8 mm) and shall have a G-90 galvanized finish on all panels to match existing.
  - 2. When re-roofing over steel decks, surface corrosion shall be removed, and repairs to severely corroded areas made. Loose or inadequately secured decking shall be fastened, and irreparable or otherwise defective decking shall be replaced.

### **3.03 INSTALLATION - GENERAL**

- A. Install GAF's Ruberoid roofing system according to all current application requirements in addition to those listed in this section to meet and maintain the warranty requirements.
- B. GAF® Ruberoid Specification #: I1220MGPF
- C. When the slope of the roof is ½" per foot or greater, install all plies parallel with the slope of the roof, and install intermediate wood nailers as required for the specific roof slope. Plies must extend over ridges and nailed on 6" centers.
- D. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

### **3.04 BITUMEN**

- A. Do not mix different types of asphalt.
- B. Use only ASTM D 312, Type III or Type IV Steep Asphalt. Type III asphalt may be used on slopes up to ½" per foot (4cm/m). Type IV asphalt must be used on all slopes greater than ½" per foot (4 cm/m).
- C. Application temperature of the asphalt must be at the Equiviscous Temperature (EVT) with a tolerance of +/- 25°F (13.9°C), at which a viscosity of 125 centipoise is attained. When using mechanical asphalt applicators, the target viscosity should be 75 centipoise.
- D. For all SBS modified asphalt flashings; the minimum application temperature of the asphalt must be at the EVT or 425°F (218°C), whichever is greater, with a rolling bank (puddle) of mopping asphalt across the full width of the roll.
- E. Do not heat the asphalt to or above its flash point or hold the asphalt at temperatures above the finished blowing temperature for more than 4 hours.
- F. Do not keep heated tankers above 325°F (163°C) overnight.

### **3.05 INSULATION - GENERAL**

- A. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
- B. Do not install wet, damaged or warped insulation boards.
- C. Install insulation boards with staggered board joints in one direction (unless taping joint).
- D. Install insulation boards snug. Gaps between board joints must not exceed ¼" (6 mm). All gaps in excess of ¼" (6 mm) must be filled with like insulation material.

- E. Wood nailers must be 3-1/2" (8.9 cm) minimum width or 1" (25 mm) wider than metal flange. They shall be of equal thickness as the insulation with a minimum 1" (25 mm) thickness. All nailers must be securely fastened to the deck.
- F. Do not kick insulation boards into place.
- G. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
- H. Do not install insulation over old lightweight insulating concrete decks without the use of a vapor retarder. Insulation should not be installed over new lightweight insulating concrete.
- I. Cant strips must be installed at the intersection of the roof and all walls, parapets, curbs, or transitions approaching 90°, to be flashed. They shall be approximately 4" (10.2 cm) in horizontal and 4" (10.2 cm) in vertical dimension. The face of the cant shall have an incline of not more than 45 degrees with the roof.
- J. Roof tape, if required over insulation joints, install in accordance with manufacturer's installation requirements.
- K. Do not install any more insulation than will be completely waterproofed each day.

### **3.06 INSULATION – BASE LAYER**

- A. The insulation must be securely attached to the roof deck.
- B. Use only fasteners with a minimum 3-inch (7.6 cm) stress plate when mechanically attaching insulation. Do not attach insulation with nails.

### **3.07 INSULATION – SUBSEQUENT LAYERS**

- A. Install insulation layers, maximum 4' x 4' (1.22m x 1.22m) board size, in accordance with manufacturer's installation requirements.
- B. Press each board firmly into place.
- C. Stagger the joints of additional layers in relation to the insulation joints in the layer(s) below by a minimum of 6" (15.2 cm) to eliminate continuous vertical gaps.

### **3.08 BASE SHEET**

- A. Type III and Type IV asphalt may be used on slopes less than 1/2" per foot. Type IV must be used on any slopes greater than 1/2" per foot.
- B. Asphalt must be applied in a full uniform layer, at a rate of 25 lbs./square (1.2 kg/m<sup>2</sup>).
- C. Base Sheet: Install full width base sheets, lapping 2" (5.1 cm) on the sides and 4" (10.2 cm) on the ends. Stagger adjacent end laps a minimum of 18" (45.7 cm) apart. Turn all plies up and over the cant strip by 2".

### **3.09 PLY / CAP SHEET**

- A. For slopes less than 1/2" per foot (4.2 cm per meter), Type III or IV asphalt may be used. Type IV must be used on all slopes 1/2" per foot (4.2 cm per meter) and over. Asphalt shall be applied at its EVT temperature or 425°F (218°C), whichever is greater, in a uniform layer, without voids, at a rate of 25 lb/square (1.2 kg/m<sup>2</sup>) ±20%. See Article 3.04 "Bitumen". The mopping stroke will be such that the side lap is covered with asphalt last. A rolling bank (puddle) of mopping asphalt must be maintained across the full width of the roll.
- B. Cap sheet application: Install full width cap sheets, lapping 3" (7.62 cm) on the sides and 6" (15.2 cm) on ends. Stagger adjacent end laps a minimum of 18" (45.7 cm) apart. All side and end laps must be staggered from underlying plies.
- C. All laps must be parallel or perpendicular to the slope of the roof such that the flow of water is never against the lap.
- D. SBS membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45°F (7.2°C). Contact GAF Contractor Services for details.
- E. Coiled rolls should be unrolled, placed upside down and allowed to "relax" prior to installation. Then re-roll to apply.

- F. Care should be taken to insure that the cap sheet lays flat in the asphalt. There must be complete adhesion between the cap sheet and the mopping asphalt. Brooming of the plies may be necessary under certain conditions to insure that the cap sheet adheres solidly to the asphalt. Apply extra pressure to avoid creating open channels, where three or more membranes are lapped.
- G. A minimum 3/8" (10 mm) asphalt flow-out must be obtained at all laps. Dry laps are not acceptable. Check all seams for full and uniform adhesion.
- H. All end laps must be staggered a minimum of 18" (45.7 cm) so that no adjacent end laps coincide. If end laps fall in line or are not staggered the proper distance, a full width of Ruberoid Mop SBS membrane must be installed over the end laps.
- I. Inter-ply and cap application: Over the base sheet or approved substrate, install 19 11/16" (50 cm) and 39 3/8" (100.0 cm) width Ruberoid® smooth starter plies, and follow with a 39 3/8" (100.0 cm) width granule surfaced sheet, applied shingle style. Lap plies 3" (7.62 cm) on side laps and 6" (15.2 cm) on end laps. Stagger adjacent end laps a minimum of 18" (45.7 cm).
- J. Membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45°F (7.2°C). Contact GAF Contractor Services for details.

### **3.10 BITUMINOUS BASE FLASHINGS**

- A. Install GAF® base flashing specification 2X20M over all cant strips, horizontal to vertical transitions, roof edges and roof penetrations. Flashings are to be secured in accordance with current GAF® application guidelines.
- B. Nailable curbs and walls must be covered with a layer of approved GAFGLAS® or Ruberoid® Base Sheet or backer ply fastened 8" (20.3 cm) o.c. in all directions with approved fasteners. All vertical laps must be 4" (10.2 cm). Base sheet or backer ply must extend out onto the field of the roof as shown in the applicable GAF® construction detail.
- C. Prime all metal and masonry surfaces with asphalt primer; and allow adequate drying time prior to adhering flashing plies.
- D. Backer plies installed over masonry or other non-nailable substrates must be cut into manageable lengths to ensure adequate adhesion to the cant strip and vertical surfaces without excessive voids. All vertical laps shall be 4" (10.2 cm). Backer plies shall extend onto the field of the roof as shown in the applicable GAF® construction detail.
- E. The finished ply of base flashing shall be run vertically to provide a selvage edge that will aid in achieving proper adhesion at the 3" (7.6 cm) vertical laps. If the sheet is run horizontally, the vertical laps must be a minimum of 6" (15.2 cm) and the selvage edge must be removed from the sheet or fully covered by the counterflashing. The finished flashing ply must extend out onto the field of the roof as shown in the applicable GAF® construction detail and must be extended a minimum of 4" (10.2 cm) beyond the edge of the prior flashing plies. The flashing must be soundly adhered to the parapet, cant area and roof surface to result in a minimum void, non-bridging construction.
- F. Base flashing heights must be a minimum of 8" (20.3 cm) and a maximum of 24" (61.0 cm) above the roofline.
- G. Use only trowel-grade modified adhesive. Apply using a trowel or wide-edged putty knife with a uniform 1/8" thickness throughout. Firmly press sheets into the adhesive, and immediately nail the top of the flashing as required by the manufacturer's standard installation and details to maintain the warranty.
- H. Corner membrane flashings, such as "bow ties" for outside corners and "footballs" for inside corners or other membrane reinforcements are required to ensure that base flashing corners are sealed at cant areas. An alternate method of corner reinforcing is to install a smooth MB membrane reinforcement piece on the prepared corner substrate prior to final surfacing membrane. Refer to MB Flashing Details section of the GAF® Application and Specifications Manual.

### **3.11 SHEET METAL**

- A. Metal should not be used as a component of base flashing. Because of the high coefficient of expansion of sheet metals and the large temperature changes that can be experienced on a roof, sheet metal or exposed metal

- components must be isolated from the waterproofing components of the roofing and flashing system as efficiently as possible to prevent the metal from splitting the membranes.
- B. All metal edge details scheduled to be included in the Edge to Edge Coverage of the Diamond Pledge Guarantee must be submitted and approved in writing by the manufacturer prior to project commencement.
  - C. When it is unavoidable to use metal in the roofing system (i.e., lead flange at drains, gravel stops), treated wood nailers and insulation stops, 1" (25 mm) wider than the metal flange, should be provided for metal flange attachment. Metal flanges must always be set on top of the roof membrane with modified trowel grade cold adhesive applied material for SBS roof systems. The metal flange is then sealed using the applicable construction detail to meet applicable guarantee requirements. Metal accessories (gravel stops, counter flashing, etc.) should be 16 oz. (0.56 mm) copper, 24 gauge (0.71 mm) galvanized or stainless steel, 2 1/2 to 4 lb (1.1-1.8 kg) lead, or 0.032" (0.81 mm) aluminum.
  - D. Fabricate and install all sheet metal materials as shown in applicable construction details. Refer to SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.) for guidance on sheet metal treatments not addressed in this specification.
  - E. Clean metal and apply asphalt primer to all sheet metal surfaces that will come into contact with asphalt or other bituminous materials; allow the primer adequate time to dry.
  - F. Use fastener types compatible with the sheet metal type.
    - 1. Copper or lead-coated copper: use copper or bronze fasteners.
    - 2. Lead and galvanized steel: use galvanized or cadmium-plated sheet fasteners.
    - 3. Aluminum: use aluminum fasteners.
    - 4. Stainless steel: use stainless steel fasteners.
  - G. Metal counter-flashing shall have a minimum 4" (10.2 cm) face with a drip lip. The bottom edge of the counterflashing shall cover the roofing membrane and/or base flashing by a minimum of 4" (10.2 cm). Metal counter flashing used for masonry walls, wooden walls, or through wall metal flashings should be a two piece design to allow for installation and later removal. Metal counter-flashings for stucco, EIFS, wood siding or similar materials should be designed appropriately, such as "Z" type flashing. End joints shall be lapped 3" (7.6 cm) or more. Adequate fasteners must be provided to secure against wind forces. Skirt fasteners shall be watertight.
  - H. Metal termination bars shall be a minimum of 1/10" (3 mm) thick x 1" (25 mm) wide with preformed sealant edge lap. Bar should have 1/4" (6 mm) x 3/8" (10 mm) slotted holes on 4" (10.2 cm) centers to facilitate mechanical anchorage.
    - 1. Note: Termination bars are not suitable in all base flashing and wall flashing conditions. Termination bars may only be used in conjunction with an appropriate counter-flashing extending a minimum of 4" (10.2 cm) below the termination bar.
  - I. Metal flanges for gravel stops, eave strips, and pitch pockets to be used in conjunction with roofing shall be primed (both sides), set in modified trowel grade cold adhesive applied material for SBS roof systems. Flanges shall be a minimum of 3 1/2" (8.9 cm) wide for gravel stops or eave strips and 4" (10.2 cm) wide for projections and extensions through the roof. The gravel stop lip should be at least 3/4" (19 mm) high. Eave strip lips shall be at least 3/8" (10 mm) high. Provisions must be made for securing the skirt to the face of the wall. This may be a wood nailer strip for masonry and metal construction. In all cases, gravel stop and eave strip nailer should be fastened to the deck or deck system with adequate resistance against wind forces.
  - J. Stacks shall have metal sleeve flashing a minimum of 8" (20.3 cm) high. Pitch pockets for brackets, supports, pad-eyes, etc., shall have a 4" (10.2 cm) minimum height metal sleeve.
  - K. On re-roofing projects, provisions shall be made for reinstallation of existing sheet metal duct work, equipment, coping metal and counterflashing removed in conjunction with the new work. Also, provide for cleaning and repairing of existing defective sheet metal, and replacement of missing and irreparable sheet metal to match existing types. Light gauge sheet metal flashings which are incorporated into the Ruberoid® roof system are not suitable for re-use and must be replaced with new material.
  - L. Conduits and piping such as electrical and gas lines must be set on wood blocking or some other form of support. Wood blocking/supports must be set on pads constructed of an additional layer of roof membrane material.

**3.12 WALKWAYS**

- A. Walkways for normal rooftop traffic may be constructed from two plies of modified bituminous membrane of the same type as the field of the roof. This type of walkway is not for sidewalk or patio-type use.
- B. Construct walkways by solidly adhering a first ply of smooth surfaced membrane to the field of the roof followed by a granule surfaced membrane to the surface of the first ply.
- C. Walkway sections should be no longer than 10' (3 m), with a 6" (15.2 cm) minimum gap between each section to allow for drainage.

**3.13 ROOF PROTECTION**

- A. Protect all partially and fully completed roofing work from other trades until completion.
- B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
- C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

**3.14 PRECAUTIONS**

- A. Certain Adhesives, Flashing Cements and Coatings are solvent based and do have an odor. These products will exhibit solvent odor during application and afterwards until fully cured and set up. Cure times can vary widely according to factors such as type of system installed, local weather and ambient temperatures. Precautions must be taken by the roofing contractor to avoid and minimize solvent odor penetration into occupied building spaces.
- B. Air intakes near the roof should be closed. Ductwork, equipment curbs, parapet walls, HVAC equipment and other deck penetrations or openings should be checked for entry sources and addressed to prevent possible odor infiltration by the contractor. Temporary measures should be coordinated with the construction manager and owner / owner occupancy.

**3.15 CLEAN-UP**

- A. All work areas are to be kept clean, clear and free of debris at all times.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
- E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION - 075500

## **SECTION 076200 - SHEET METAL FLASHING AND TRIM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to the following:
  - 1. This project is a Phased construction type project, and as such there shall be work of this Section included in all Phases of construction to the extent required by contract drawings and or as required to install new work.
  - 2. Components and systems shall match the existing systems and profiles.
    - a. Flashings, counter flashings, sheet metal roofing accessories, and fabricated sheet metal items.
    - b. Metal cap flashings.
    - c. Metal flashing and counter flashings at walls, openings, curbs and rails.
    - d. Pre-finished and preformed metal fascia and trim members where indicated to match existing.
    - e. Sill of masonry openings and other profiles.
    - f. Other sheet metal flashing indicated on Drawings and not specified elsewhere or required to make areas watertight.
    - g. Pre-finishing of above metals in colors as selected by Architect from manufacturer's standard and custom colors to match balance of project metal colors.
- B. Related Sections:
  - 1. Division 06 – Rough Carpentry
  - 2. Division 07 – Roofing
  - 3. Division 07 – Joint Sealers
  - 4. Division 07 – Firestopping Systems
  - 5. Division 07 – Roof Accessories
  - 6. Division 09 – High Performance Coatings

#### **1.2 DEFINITIONS**

- A. Not Exposed to View: Items not in line of sight from exterior of building (not restricted to street level), generally includes items at roof level of building and on roof side so they can be viewed only from roof.
- B. Exposed to View: Items in line of sight from exterior of building (not restricted to street level), generally includes items on exterior side of building from top of parapets down to street level.

#### **1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements: Fabricate and/or install flashing and sheet metal permanently watertight, and in manner that will not deteriorate in excess of manufacturer's published limitations.
- B. Comply with NRCA/SMACNA Standard, and ANSI-SPRI ES-1 requirements.
- C. Sheet Metal Flashing and Accessories: Provide installation of sheet metal Work with no fasteners exposed to elements.



- D. Wind Resistance: Design, fabricate, and install to withstand wind loads, structural movement, thermally induced movement, and exposure to weather, in accordance with wind requirements, as indicated in DIVISION 07
- E. - Roofing, without failing.
- F. Notify Architect of any instances which will not comply with above requirements.

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with requirements of DIVISION 01 Submittals and as modified below.
- B. Product Data: For each product indicated submit product specifications, installation instructions, and manufacturer recommendations for each specified sheet metal material and fabricated product.
- C. Shop Drawings: Submit drawings indicating layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing, trim and fabricated work. Include counter flashings, fascia and coping units, gutters, downspouts, scuppers, and expansion joint systems.
- D. Samples: For each type of sheet metal flashing and trim. Submit a minimum of (2) samples for each product.
  - 1. Include 3-inch square samples of specified sheet materials to be exposed as finished surfaces and
  - 2. (2) samples, 12-inch long of finished units of specified fabricated products exposed as finished installation.
- E. Submittals for manufactured units are to be received by Architect no less than 20 days after award of contract.

#### **1.5 QUALITY ASSURANCE**

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown on documents unless more stringent requirements are indicated.
- B. Mockups: Provide Mockup as part of building wall to view a total wall assembly. Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical edge condition. Mockup to include changes in direction and plane as experienced on the project where applicable. Mock-up to be approximately 48 inches long, including supporting construction cleats, seams, attachments, supporting construction, and all associated accessories.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion based on the approval of the Architect.
  - 3. Locate mock-up with Architect in field.
- C. Fabricator and Installer Qualifications: Company specializing in producing sheet metal work with a minimum of five (5) years of successful documented experience.
- D. Pre-installation Conference: Conduct conference at Project site, either directly prior to or after Progress Meetings, as directed by Architect. Coordinate conference schedule with completion of roofing work and schedule for completion.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aluminum Sheet: Aluminum sheet or strip of alloy and temper recommended by producer for indicated use. Unless otherwise indicated or recommended by manufacturer, provide aluminum sheet meeting ASTM B209, for fabricated products.
1. Provide minimum gauge of aluminum sheet as recommended in SMACNA "Architectural Sheet Metal Manual" for profiles indicated on drawings, but not less than .050 inch unless otherwise noted on details and documents for metal exposed to view.
    - a. Edge metal shall be .050-inch aluminum with finish to match the roof edge material unless otherwise noted on details and documents.
    - b. Multiple colors may be selected by Architect for flashing and trim accessories. Final color as selected by the Architect.
    - c. Separate all fire-retardant treated wood products from metal surfaces using #30 building felt or self-adhesive membrane as a separation sheet.
    - d. Movement joints in material shall confirm to requirements specified in "Fabrication" below.
    - e. Match existing systems in place where disturbed by work activities or where modification is required to achieve end result required by Architect and Owner.
  2. Aluminum at Concealed Locations and Locations Not Exposed to View: ASTM B209 (ASTM B209M), 6063 alloy, H14 temper; min of 0.032-inch thick; mill finish.
  3. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015-inch thick; smooth No. 4 finish to be used as flashing in masonry work.
  4. Finishes:
    - a. At material exposed to view: Provide manufacturer's standard finish to match existing roof coping and edge metal; color as selected by Architect from manufacturer's full range of standard colors and custom colors (Kynar and Anodized finishes).
      - 1) Architect to choose from full range of standard and premium Kynar 500 series paint and anodized finishes to match existing.
    - b. A separate color/finish will be selected by Architect for each building included in project scope as appropriate for application to meet the existing conditions.

### **2.2 ACCESSORIES**

- A. Provide miscellaneous materials and accessories required for complete installation.
1. Fasteners: Same material and finish as flashing metal, with soft neoprene washers. No exposed fasteners allowed.
  2. Clips or Cleats: At a minimum provide metal of the same material and gage as sheet metal being installed.
  3. Underlayment: ASTM D 226, organic roofing felt, Type II ("No. 30").
  4. Slip Sheet: Rosin sized building paper.
  5. Primer: Type recommended by finish manufacturer.
  6. Protective Backing Paint: Zinc rich alkyd.
  7. Sealant: As specified in DIVISION 07 – Joint Sealant. Roofer's mastic is not acceptable.

8. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant or approved equal. Roofer's mastic is not acceptable.
  9. Plastic Cement: ASTM D 4586, Type I.
  10. Solder: ASTM B 32; Sn50 (50/50) type. Solder and Fasteners: Provide type solder and fasteners recommended by producer of metal sheets, for fabrication and installation.
  11. Epoxy Seam Sealer: Two-part non-corrosive metal seam cementing compound as recommended by sheet metal manufacturer for exterior non-moving joints.
  12. Reglets: Metal or plastic units of the type and profile indicated; compatible with flashing indicated; non-corrosive.
  13. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.
- B. Provide bent and fabricated items in the profiles and dimensions required to meet the conditions noted on the drawings.

### **2.3 MANUFACTURED UNITS**

- A. As a Basis of design, details and specifications for metal edge systems have been based on specified products by the following manufacturer which relate to work included in DIVISION 07 for Roofing Systems currently in place:
- a. GAF Roofing Systems
  - b. Or approved equal to match existing.
- B. Single Source – Maintain single responsibility for performance and warranty of edge system, flashings, and all metal components supplied on the project. All products shall comply with roof manufacturer's warranty requirements:
1. All components of the edge system shall be covered by roof manufacturer's warranty, including fascia cover, coping cap, water dam, continuous cleat, clip, extender, closures fastener hardware, flashings, and accessories to match existing.
  2. Roof Edging system to be supplied by the appropriate roofing manufacturer to match existing and be included in the total roof system warranty including the warranty amendment required at the end of the project.

### **2.4 QUALITY ASSURANCE**

Metal edge system shall be certified by the manufacturer to comply with a minimum requirement of ANSI/SPRI ES-1-98, FM I-90 and FM 1-645 approved and shall resist wind speed as specified

### **2.5 WARRANTY/GUARANTEES**

- A. Manufacturer's Standard Warranty: All manufactured metal flashing and trim units and accessories specified under this section are to be covered by the roof system manufacturer's warranty in DIVISION 07 Roofing.
1. All Custom Fabricated items are to be provided by the roof manufacturer and included in the system warranty.

## **2.6 PRODUCTS**

- A. Refer to drawings for locations of roof system types, manufacturer, metal edge system and profiles.
- B. Fascia System: Match existing system in place for each roof system.
  - 1. Edge metal with a continuous anchor bar roof edge fascia system consisting of a continuous 0.100-inch-thick extruded aluminum bar, corrosion resistant stainless-steel fasteners and snap-on fascia cover or approved equal, to match existing.
  - 2. Anodized or Kynar 500 or aluminum finish as selected by Architect to match existing finishes.
- C. Performance Characteristics:
  - 1. Extruded bar shall lock membrane, prevent wind pullback at fascia.
  - 2. Provide splices to allow thermal expansion of extruded aluminum anchor bar.
  - 3. Fascia shall allow for thermal expansion on extruded bar, preventing periodic maintenance.
- D. Fascia metal gauge: A minimum of .050" thick formed aluminum with Anodized or Kynar 500 finish in color selected by Architect to match existing.
- E. Fascia: standard 12'-0" lengths with slip joint splices using metal of matching thickness and color of the roof edge, minimum 8" long unless otherwise noted on the drawings. Movement joints in material shall conform to requirements specified in "Fabrication" below.
- F. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 10'-0" to 12'-0" standard lengths. All bar miters are welded including corners. Fastened at a minimum of 12" oc.
- G. Fasteners: Min. #12 x 1-5/8" corrosion resistant fasteners provided with drivers. No exposed fasteners permitted.
- H. Exterior finishes:
  - 1. Aluminum shall be anodized or painted Kynar 500 finish from the manufacturer's full line of standard and premium colors. Painted finish shall be a multicoat (3) coat color selected by architect from full range of standard and premium colors with protective clear coat.
  - 2. Final finish selection to match existing by Architect during submittal phase.

## **2.7 MISCELLANEOUS MATERIALS**

- A. General: Provide materials and components to conform with the manufacturers existing warranty requirements. All materials, types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated acceptable to roofing manufacturer.
  - 1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. acceptable to roofing manufacturer.

- C. Fasteners: Shall be concealed to view. Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads. Fasteners to meet corrosion resistant requirements and be compatibility with all materials utilized. Fasteners to meet manufacturer's requirements for strength, loads, and system compatibility.
  - 1. Exposed Fasteners: Not allowed and only in special conditions. Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
  - 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
  - 3. Blind Fasteners: Stainless-steel screws or rivets.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape. Refer to DIVISION 07 – Joint Sealants for additional requirements.
- E. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight as approved by the roofing manufacturer for the system. Refer to DIVISION 07 – Joint Sealants for additional requirements.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement as approved by the roofing manufacturer for the system. Refer to DIVISION 07 – Joint Sealants for additional requirements.
- G. Epoxy Seam Sealer: Two-part, non-corrosive, aluminum seam-cementing compound as approved by the roofing manufacturer for the system.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat as approved by the roofing manufacturer for the system.

## **2.8 REGLETS**

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counter-flashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions.
  - 1. Manufacturer's Material: If other than roofing system manufacturer's materials are to be utilized then the proposed products shall be approved in writing by roof system manufacturer in advance of their use.
  - 2. Material: Aluminum, 0.032-inch thickness minimum unless otherwise noted. Material to be finished to match roof edge material selected with Kynar 500 Paint finish to match existing.

## **2.9 FABRICATION - GENERAL**

- A. General: Provide materials and components to conform with the roofing manufacturers existing warranty requirements. Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations. Provide 3/8" gap for movement within 24" of each inside and outside corner. Provide movement joint between straight run of metal spaced to meet SMACNA requirements.
- D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints as recommended by manufacturer.
- E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal, and in thickness not less than that of metal being secured.

## **2.10 FABRICATED ITEMS**

- A. All Custom Fabricated items are to be provided by a fabricator experienced in working with materials and systems associated with the work. Provide materials and components to conform with the manufacturer's warranty requirements.
  1. Custom fabricated items are to be shop fabricated unless otherwise noted.
- B. Fabricate flashing and sheet metal items from aluminum sheet with a minimum of .050" thick formed aluminum with Anodized or Kynar 500 finish in color selected by Architect.
  - 1.
- C. Custom fabricate metal sill flashings, trim, caps, expansion joints, and similar items to comply with profiles and sizes shown on drawings or to match existing profiles.
  1. Comply with standard industry details as shown by SMACNA in the "Architectural Sheet Metal Manual". Comply with metal producer's recommendations for tinning, soldering, and cleaning flux from metal.
  2. Anchorage Devices: In accordance with SMACNA requirements.

## **2.11 PROTECTIVE FINISH**

- A. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils.
- B. Provide a protective layer of #30 building paper or self-adhesive membrane to separate all treated lumber and metal surfaces to prevent corrosion.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Comply with DIVISION 01 requirements.
  1. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, blocking, inserts, and nailing strips correctly located.

2. Verify roofing termination and base flashings are in place, sealed, secure, finished, and accepted.
  3. Provide systems, materials, and components to conform with the roofing manufacturers existing warranty requirements (GAF).
- B. Verification of Conditions (by Installer/Applicator): Examine conditions under which materials in this section are to be installed. Coordinate with the General Contractor and confirm conditions are satisfactory in writing, with copies to the Owner's Representative and Architect, identifying any conditions detrimental to the proper and timely installation of the work that require correction. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer / Contractor.
- C. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner's Representative and Architect. Failure to submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.

### **3.2 PREPARATION**

- A. Coordination: Coordinate flashing and sheet metal with other construction for correct sequencing of items making up entire system of waterproofing and rain drainage. Do not proceed with flashing and sheet metal installation until curb and substrate construction, cant strips, blocking, reglets, and other construction to receive flashing and sheet metal items are complete.
1. Provide systems, materials, and components to conform with the roofing manufacturers existing warranty requirements (GAF).
- B. Field measure site conditions prior to ordering and fabricating metal work.
- C. Install starter and edge strips, and cleats before starting installation.
- D. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils.
- E. Provide a protective layer of #30 building paper or self-adhesive membrane to separate all fire-retardant treated lumber and metal surfaces to prevent corrosion.

### **3.3 INSTALLATION - GENERAL**

- A. Submit product design drawings and details in accordance with the roof manufacturers 30-year warranty roof system requirements for review and approval to Architect before fabrication.
- B. Installing contractor shall check as-built conditions and verify coping details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the manufacturer's installation guide when setting copings.
- C. Installer shall use provided fasteners consistent with manufacturer's instructions suitable for the substrate to which it is being installed.
- D. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement using concealed fasteners. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.
- E. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted by Architect and, Owner.
1. Cleats: Comply with SMACNA Manual. Unless otherwise indicated or specified, provide 2-inch wide by 3-inch long of same material and thickness of metal installed. Secure one end with two fasteners and fold cleat over fastener head.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
- G. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- H. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and butyl sealant as required by the manufacturer.
- I. 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.
1. Space cleats not more than 12-inches apart or in accordance with the manufacturer's spacing requirements. Anchor each cleat with a minimum of two fasteners. Bend tabs over fasteners.
  2. Provide continuous cleats where required for wind zone compliance and required by roof manufacturer for warranty compliance.
- J. Seams: Comply with SMACNA Manual Figures 3-2 & 3-3 and other plates applicable to specific installations. Provide following unless otherwise indicated or specified:
1. Standing Seams: Not less than 1-1/2 inch high.
  2. Flat Lock Seams: Not less than 3/4 inch wide.
  3. Lap Seams: Overlap 4 inches. Do not solder.
  4. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required but provide no visible fasteners in finish Work.
  5. Seams: Orient properly for direction of water flow.
- K. Lap, lock and seal metal joints watertight.
- L. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints in accordance with the manufacturer's installation instructions and recommendations. Provide movement joints within 24" of inside and outside corners and in straight runs of all edge metal systems spaced equally. Movement joints shall be a minimum width of 3/8" between sheets at seam splices. Provide back sheet of same material and finish at seam splices.
- M. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
1. Galvanized or Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
  2. Aluminum: Use stainless-steel fasteners.
  3. Stainless Steel: Use stainless-steel fasteners.
  4. Fasteners in contact with fire retardant treated wood items: Use stainless- steel fasteners 316 or better.



- N. Seal joints with butyl sealant as required for watertight construction unless otherwise required by the roofing manufacturer.
- O. Comply with manufacturer instructions for handling and installation of flashing and sheet metal items.
  - 1. Unless otherwise recommended by manufacturer, comply with recommendation of SMACNA "Architectural Sheet Metal Manual" for items shown on Drawings.
  - 2. Refer to details and profiles shown on Drawings.
- P. For non-moving seams, provide soldered flat lock seams, except as otherwise indicated. Comply with metal producer's recommendations for tinning, soldering, and cleaning the joints.
- Q. Provide for thermal expansion of all exposed sheet metal exceeding 15 ft. running length.
  - 1. Flashing and Trim: 12 ft. maximum spacing, 2 ft. from corners and intersections.
- R. Conceal fasteners and expansion provisions wherever possible. Fold back edges on concealed side of exposed edges to form hem.
- S. Insert flashings into reglets as required by manufacturer's installation instructions. Anchor by mechanical means, including driven wedges of lead or other compatible metal, spaced 2 ft. Seal joint with sealant as indicated; refer to DIVISION 07 for more information on joint sealants.
- T. Separate dissimilar items from dissimilar metals by 15 mil dry film thickness bituminous coating, or by heavy tinning of solder at spot contacts.
- U. Fabricate, support and anchor rain drainage in manner that will withstand thermal expansion stresses and full loading by water or ice, without damage, deterioration or leakage.
- V. On bituminous membranes, provide not less than 4 inches embedment of flashing in membrane, and cover edge with tape or stripping set in roofing cement.
- W. Fasteners: Stainless steel. No exposed fasteners. Refer to specified grades noted above. If not specified provide a minimum grade of 316 or better.
- X. Expansion and Contraction:
  - 1. Provide for thermal expansion and contraction and building movement in completed work.
  - 2. Make watertight and weather tight throughout.
  - 3. Provide expansion joints at maximum of 12 feet and not more than 2 feet from corners or intersections. Install in compliance with SMACNA Figure 1-5 and as indicated on Drawings. Seal joints with sealant in accordance with Division 07.
  - 4. Where lapped or bayonet type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### **3.4 ROOF FLASHING INSTALLATION**

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Counter-flashing: Coordinate installation of counter-flashing with installation of continuous membrane. Insert counter-flashing in reglets or receivers and fit tightly to base flashing.

Secure in a waterproof manner. Extend counter flashing over continuous roof membrane. Lap counter-flashing joints a minimum of 4 inches and bed with sealant approved by the roofing manufacturer to maintain the warranty requirements.

- C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install in accordance with the roofing manufacturer's existing warranty requirements.

### **3.5 WALL FLASHING INSTALLATION**

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. All end wall terminations of roof copings, fascia, and expansion joints will be terminated with a vertical leg of the lower flashing material being covered by counter flashing installed on the wall surface. Counter flashing color shall be selected by the Architect.
- C. Reglets: Install reglets in accordance with the roofing manufacturer's installation requirements to maintain the warranty.
- D. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches minimum beyond wall openings.
- E. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.
- F. Provide systems, materials, and components to conform with the roofing manufacturers existing warranty requirements (GAF).

### **3.6 DAILY SEAL**

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the workday, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Use adhesive or other similar material in accordance with the manufacturer's requirements.

### **3.7 CUSTOM FABRICATED ITEMS**

- A. Comply with standard industry details as shown by SMACNA in the "Architectural Sheet Metal Manual". Comply with metal producer's recommendations for tinning, soldering, and cleaning flux from metal.

### **3.8 PROTECTING AND CLEANING**

- A. Protect sheet metal systems from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Protect adjacent elements as required by the manufacturer.
- D. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
  - 1. Schedule work to ensure that the sheet metal system is protected and covered if not complete after installation.

2. Protect roofing system from damage during installation of other systems subsequent to completion of roofing operations.
- E. Dispose of all debris legally and in accordance with local jurisdiction requirements.
- F. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally.
- G. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

### **3.9 FIELD QUALITY CONTROL**

- A. See DIVISION 01 - Quality Requirements, for field inspection requirements.
  1. Inspection will involve review of work during installation to ascertain compliance with Construction Documents.

END OF SECTION 076200

## **SECTION 077200 - ROOF ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
  - 1. Curbs and Rails
  - 2. Curb Extension Boxes
  - 3. Custom Caps for Curbs
  - 4. Caps for curbs with side duct discharge
  - 5. Pipe Hood Assembly
  - 6. Roof equipment supports
  - 7. Support legs
  - 8. Roof Ladder Up Post at existing roof hatch ladder locations
  - 9. Guard Rail System
  
- B. Related Sections
  - 1. DIVISION 05 - Metal Fabrications
  - 2. DIVISION 05 - Structural Steel
  - 3. DIVISION 06 - Rough Carpentry
  - 4. DIVISION 07 - Roofing
  - 5. DIVISION 07 - Sheet Metal and Flashing
  - 6. DIVISION 23 - Mechanical Work
  - 7. DIVISION 26 - Electrical Work

#### **1.2 SUBMITTALS**

- A. Procedure: Comply with requirements of DIVISION 01 - Submittals and as modified below each product indicated.
- B. Product Data: Submit specifications, rough-in diagrams, details and installation instructions for each type of roof accessory required, including details and certifications required to show compliance with specified requirements. For each type of roof accessory indicated.
- C. Shop Drawings: Show fabrication and installation details for roof accessories. Submit full shop drawings, showing attachment to structure and coordination with related adjacent construction. Indicate profiles, sizes, connections, size and type of fasteners and accessories.
- D. Samples: Provide samples for each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepare samples to adequately show color.
- E. Quality Control Submittals
  - 1. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable) indicating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.
  
- F. Contract Closeout Submittals: Comply with requirements of DIVISION 01 - Closeout, including submission of operating and maintenance instructions as item in "General Construction Instructions" manual described in that section.

### **1.3 QUALITY ASSURANCE**

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
- B. Qualifications
  - 1. Installer: Approved and under supervision of manufacturer of each system specified.

## **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, manufacturers listed in other Part 2 articles.

### **2.2 MISCELLANEOUS METAL MATERIAL**

- A. Refer to DIVISION 07 - Sheet Metal Flashing and Trim for flashing material for additional requirements.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated where required
- C. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.

### **2.3 ROOF CURBS / EXTENSIONS /**

- A. **Roof Curb Extensions for Pipe and Conduit Utility Service Work:** At equipment curbs (new) provide curb extension and hood assembly made of heavy 16ga. aluminum construction similar to Pate pipe hood assembly model #PHA-2q6 Double Sided Unit - with B-Q6 Quad 4 port boot, or approved equal:
  - 1. Removable top cover,
  - 2. Faceplate (with BQ6 – Flexible Boot Cover), and 3-sided body for easy maintenance and access to the hood interior.
  - 3. Provide separate fully welded and insulated aluminum mounting base (2.25” high) to isolate hood from galvanized curb.
  - 4. Field insulate hood interior and caulk all exposed joints after installation of piping.
    - a. At new roof penetration locations provide new curbs; similar to Pate PC-2 18" O.D. X 18" O.D x height required to maintain a minimum of 8” clear flashing height for roof system terminations. Provide galvanized steel construction for insulated curb with FRTW nailer; or approved equal.
    - b. Utility lines to be a minimum of 12” clear above the roof finished surface.
  - 5. Sloped Hood Top - Insulate top of hood assembly with tapered insulation and wrap with metal to match hood assembly. Hood shall be sloped to shed water as shown on drawings.
  - 6. Field paint exposed metal with high performance paint refer to Division 09, color as selected by Architect from full range of colors.

## **2.4 ROOF EQUIPMENT SUPPORTS**

### **A. Roof Equipment Supports**

1. Rails: Unless otherwise noted, miscellaneous roof equipment supports shall be similar to an internally reinforced, heavy gauge galvanized steel (min. 18ga.) with continuous welded corner seams, integral base plate, fire retardant treated wood nailer, counter flashing, and minimum 1-1/2 inch thick rigid insulation; height and profile to provide an 8" minimum flashing height as shown on Drawings and as required by manufacturer for equipment load and wind loading conditions.
2. Rails to extend beyond supporting structural member below roof deck by a min of 6" to provide adequate weight distribution.
3. Provide products and style as required by field conditions and approved by Architect.
  - a. Rail bases by the Pate Co., Broadview, Illinois, or approved equal.
    - 1) Similar to "Style ES-5" straight base or;
    - 2) Similar to "Style ES-5b" for insulated base.
4. Provide rubber / neoprene vibration pads on all condensing units sitting on roof curbs or rails to prevent vibration and noise transmission to the building structure. Mechanically fasten equipment to rails.
5. Refer to drawings for more information on rail supports for specific work items.

## **2.5 ROOF SUPPORT LEGS**

### **A. Support Legs**

1. Provide support legs for roof mounted duct work, piping, and conduit similar to the following:
  - a. Duro-Block rooftop support solutions, series "DB\_DS" Series or approved equal.
  - b. Provide 2 base supports with a min of 1" high galvanized channels.
  - c. Riser Channels shall be (SH Style) – 1 5/8" x 1 5/8" x 12 ga.
  - d. Fittings & Hardware - Electro-Plated Steel
  - e. Ultimate Load Capacity - 1,000 lbs. (uniform load)
  - f. Size leg supports to suite the material and equipment being supported.
  - g. Coordinate width, length, and height of leg support based on the proposed layout and configuration of the work elements in the field.
  - h. Provide submittal identifying layout and system assembly required for application including all accessories.
  - i. Provide sleeve supports at leg assemblies to protect and prevent crushing of insulation on pipes and duct.
  - j. Field assemble leg supports.
  - k. Fasten supporting items to leg assembly with clamps, straps or suitable mechanical means.
  - l. Provide all necessary accessories including but not limited to clamps, angle brackets, fittings, brackets, splicing brackets, fasteners and bolts required to make a complete installation.
    - 1) Supports shall be made of 100% recycled rubber and are designed to provide an economical support for pipes, HVAC systems, rooftop walkway systems, ducting, conduit, cable tray, etc.
    - 2) Qualifies for LEED credits, reflective strip on both sides allow for easy product visibility

- 3) Channel is through bolted on all sizes for added strength
- 4) 1" gap between blocks allows water to flow freely around longer assemblies
- 5) No roof penetration required;
- 6) Product composition is not sharp or abrasive; to extend the roof life and resistant to freeze/thaw
- 7) Supports help dampens vibration, no need for supplemental rubber pad
- 8) Will not float or blow away; UV resistant; compatible with roofing system
- 9) Drainage channel through center of block is permitted so not to restrict water flow.
- 10) Spacing shall be 3'-0" oc max. Reduce spacing as directed by Architect and engineer to properly support work elements.
- 11) Provide protection pad under each foot support if required by roof system manufacturer to comply with warranty requirements.
- 12) Bottom of duct or pipe to be a min of 12" above the finished roof surface typical for all supports. Refer to architectural and mechanical drawings for more information.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which materials in this section are to be installed. Coordinate with the General Contractor and confirm conditions are satisfactory in writing, with copies to the Owner's Representative and Architect, identifying any conditions detrimental to the proper and timely installation of the work that require correction. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer / Contractor.
- B. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner's Representative and Architect. Failure to submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.

### **3.2 INSTALLATION**

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install all roof mounted units on blocking and fasten securely in accordance with manufacturer's installation instructions. Entire installation shall be level, plumb and square.
- C. Install roof accessories to fit substrates and to result in watertight performance.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
  3. Provide separation of all fire-retardant treated wood blocking from all metal surfaces and materials. Use #30 building felt or self-adhesive EPDM flashing membrane as a separation sheet or approved equal.
  4. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- E. Install roof accessories level mounted on slopped or level blocking and fasten securely, in accordance with manufacturer installation instruction install all items, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- F. Seal joints with elastomeric or butyl sealant as required by manufacturer of roof accessories.
- G. Comply with applicable wind load requirements for installation and fastening of all systems noted in this section.

### **3.3 PROTECTING AND CLEANING**

- A. Protect system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Protect adjacent elements as required by the manufacture.
- D. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
  1. Schedule work to ensure that the sheet metal system is protected and covered if not complete after installation.
  2. Protect roofing system from damage during installation of other systems subsequent to completion of roofing operations.
- E. Dispose of all debris legally and in accordance with local jurisdiction requirements.

END OF SECTION 077200



## **SECTION 078400 - FIRESTOPPING SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes but is not Limited to the Following: Work to be complete within each Phase of construction:
1. This project is a Phased construction type project, and as such there shall be work of this Section included in all Phases of construction to the extent required by contract drawings and or as required to install new work.
  2. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items whether in floors, walls, ceilings, roof assemblies.
    - a. Firestopping materials.
    - b. Firestop all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not.
    - c. Firestop field penetrations to conform to code requirements.
- B. Construction-gap firestopping occurring at but not limited to the following construction types:
1. Fire-resistance-rated floor and roof construction.
  2. Fire-resistance-rated walls and partitions.
  3. Smoke barriers and construction enclosing compartmentalized areas.
  4. Sealant joints in fire-resistance-rated construction.
  5. Fire-rated compressible filler and sealant joint materials installed between top of partition walls and roof/floor deck in fire-resistance-rated construction.
- C. Related Sections:
1. DIVISION 04 – Unit Masonry Assemblies
  2. DIVISION 05 – Structural Steel
  3. DIVISION 05 – Metal Fabrications
  4. DIVISION 07 – Joint Sealers
  5. DIVISION 07 – Bituminous Roofing
  6. DIVISION 07 – Roof Accessories
  7. DIVISION 07 – Applied Fireproofing
  8. MECHANICAL DIVISION - Heating and Plumbing Work: Firestopping for penetrations containing Heating Work items.
  9. ELECTRICAL DIVISION - Electric Work: Firestopping for penetrations containing Electric Work items specified. Including Lightning Protection Systems.

#### **1.2 REFERENCES**

- A. Reference Standards:
1. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; current edition.
  2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; current edition.
  3. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; current edition.

4. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; current edition.
5. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
6. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

### **1.3 PERFORMANCE REQUIREMENTS**

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop 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 construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E814 or UL 1479:
  1. F - Rated Through-Penetration Firestop System: Provide systems with F ratings as determined per ASTM E814 not less than that equaling, or exceeding, fire-resistance rating of construction penetrated with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water.
    - a. Provide systems with at least 1-hour F rating for fire-rated penetrations through floor/ceiling or roof/ceiling assemblies.
  2. T - Rated Through- Penetration Firestop Systems: Provide systems with T - ratings, in addition to F - ratings, as determined per ASTM E814, where systems protect penetrating items through fire-rated floor/ceiling and roof/ceiling assemblies. T - rated assemblies are not required where following conditions exists:
    - a. Floor penetrations that are contained and located within the cavity of a wall.
    - b. Floor penetrations by pipe, tube and conduit that are not in direct contact with combustible material.
  3. Fire-Resistive Joint Sealants and Fire-Rated Compressible Filler Materials. Provide materials with fire-resistance rating of construction in which joint occurs.
  4. Firestopping Exposed to View: Provide products with flame-spread values of less than 25 and smoke- developed values of less than 450, as determined per ASTM E84.
  5. Firestopping Exposed to View, Traffic, Moisture, and Physical Damage: Provide products that do not deteriorate when exposed to these conditions:
  6. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
  7. Where Firestopping sealant system is exposed to view and requires field paint finish, provide latex type fire rated sealant which can be field painted.

### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 - SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product

specified below as required to demonstrate compliance with specified requirements and provide complete application information.

1. **Schedule of Firestopping:** List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number in a submittal using a schedule format to display requirements.
  2. **Product Data:** Provide data on product characteristics, performance ratings, and limitations. Submit manufacturer's product data for each firestopping product required, including specifications and installation instructions, indicating compliance with specified requirements.
  3. **Manufacturer's Installation Instructions:** Indicate preparation and installation instructions.
  4. **Manufacturer's Certificate:** Certify that products meet or exceed specified requirements.
- C. **Shop Drawings:**
1. **Through-Penetration Firestop Systems:** Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item.
    - a. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
    - b. Material and make up of item being penetrated such as wall (interior or exterior), slab, or roof.
    - c. Submit documentation, including illustrations, from qualified testing and inspecting agency that is applicable to each through-penetration fire stop configuration for construction and penetrating items.
    - d. Provide plan location drawing of illustrations.
    - e. Provide a schedule indicating drawing #, location, assembly #, and configuration. Provide any other information required by the Architect or the local reviewing agency having jurisdiction over the project.
- D. **Quality Control Submittals:**
1. **Qualification Data:** Submit qualification data for sub-contractor demonstrating capabilities and experience of the company and technicians to perform the work specified.
    - a. Signed by fireproofing system manufacturer certifying that Installer is approved, certified, authorized, or licensed by the manufacturer to install the fireproofing system specified.
    - b. See Quality Assurance requirements specified below.
  2. **Test Reports:** Submit product test reports from, and based on tests performed by, qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
  3. **Certificates:** Submit product certificates signed by firestopping products manufacturer certifying that their products comply with specified requirements. Manufacturer shall certify in writing that they approve the Installer of the firestopping material to be used on this project.
- E. **Qualification Data:** For Installer.

- F. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
1. Requirements of DIVISION 01 - CLOSEOUT PROCEDURES;
    - a. Submission of maintenance instructions;
    - b. Record documents.

## **1.5 QUALITY ASSURANCE**

- A. Qualifications:
1. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from single manufacturer.
  2. Installer: Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience and approved in writing by manufacturer, for installation of manufacturer's products. Experienced Installer who is certified, licensed, or otherwise qualified by firestopping manufacturer as having necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell firestopping products to contractor or Installer does not itself confer qualification on Installer.
    - a. Single Source: Provide firestopping materials produced by same manufacturer for all subcontractor work on entire Project. One Subcontractor shall do all firestopping for general project and MEP work.
- B. Fire Testing: Provide firestopping assemblies of designs which provide the specified fire ratings when tested in accordance with methods indicated.
1. Listing in the current classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years successful documented experience, maintaining an office within 60 miles of the project site, and employing a knowledgeable product representative.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency that is UL certified and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
  2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article, ASTM E814.
    - a. Provide rated systems bearing classification marking of qualified testing and inspecting agency.
    - b. Correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory".
  3. Fire-Resistive Joint Sealant Systems: Identical to those tested per ASTM E119 and complying with following requirements:
    - a. Fire-resistance ratings of joint sealants correspond to design designations listed by UL in their "Fire Resistance Directory".

- b. Sealants and backing materials bear classification marking of qualified testing and inspection agency.
- E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, as required by authorities having jurisdiction.

#### **1.6 REGULATORY REQUIREMENTS**

- A. Comply with:
  - 1. Fire Safing and Smoke Barrier System: UL tested and approved for two-hour fire separation between floors.
  - 2. Fire Rated Penetration Sealant Systems: UL 1479 and ASTM E814 and listed in UL Building Materials Directory with F and T ratings to equal rating of floor or wall assembly.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver firestopping products to Site in original, unopened containers or packages with intact and legible manufacturers' labels identifying:
  - 1. Product and manufacturer;
  - 2. Date of manufacture;
  - 3. Lot number;
  - 4. Shelf life, if applicable
  - 5. Qualified testing and inspection agency's classification marking applicable to Project;
  - 6. Curing time; and
  - 7. Mixing instructions.
- B. Storage and Protection: Store and handle firestopping materials to prevent deterioration due to moisture, temperature changes, contaminants, or other causes.

#### **1.8 PROJECT / SITE CONDITIONS**

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for three (3) days after installation of materials.
- B. Keep product away from heat, open flame, sparks, or other sources of ignition until curing is complete. Provide adequate ventilation in areas where solvent-cured materials are being installed.
- C. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
  - 1. Ventilation: Ventilate firestopping per manufacturer's instructions by natural means or, where inadequate, forced air ventilation.

- D. Existing Conditions: Information on Drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require Architect's prior approval. Submit documentation showing that performance of proposed substitutions equals or exceeds that of systems they would replace and are acceptable to authorities having jurisdiction.

## **1.9 SEQUENCING**

- A. Sequence installation of adjacent work to allow access for installers of firestopping.
1. Locate joints in ductwork to allow firestopping to be installed before the penetration is made inaccessible by continued installation of ductwork.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As a basis of design, details and specifications have been based on specified products by:
1. 3M Fire Protection Products, St. Paul, Minnesota.
  2. The RectorSeal Corp., Houston, Texas.
  3. International Protective Coatings Corp., Oakhurst, New Jersey.
  4. Thermafiber, LLC (Div. of Owens Corning), Wabash, Indiana.
  5. Fibrex Insulations, Inc., Sarnia, Ontario, Canada.
  6. Rock Wool Manufacturing Co., Leeds, Alabama.
  7. Hilti Firestop Systems.
  8. Specified Technologies, Inc.
- B. Provide products from a single source manufacturer.

### **2.2 FIRESTOPPING**

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- C. Asbestos Content: Provide firestopping products containing no detectable asbestos as determined by method specified in 40 CFR Par 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
- D. Mortars:
1. 3M Fire Protection Products: "3M Fire Barrier Mortar".
  2. The RectorSeal Corp.:

- a. "Bio Fireshield Bio K-10 Mortar"
  - b. "Bio Fireshield Bio K-2 Mortar"
  - c. "Metacaulk Fire Rated Mortar"
  - d. "Flamesafe Mortar"
3. Or approved equal.
- E. Sealants and Caulks:
1. 3M Fire Protection Products:
    - a. "3M CP 25WB+ Caulk"
    - b. "3M FB2000+ Sealant"
  2. The RectorSeal Corp.:
    - a. "Bio Fireshield BIOSTOP 500+ Intumescent Firestop Caulk"
    - b. "Bio Fireshield Biotherm 100 and Biotherm 200 Firestop Sealants"
    - c. "Metacaulk 1000, 905, 880 & 835 Firestop Caulk"
    - d. "Flamesafe FS 900 Series"
    - e. "Flamesafe FS 1900 Series"
    - f. "Flamesafe C700 Sealant"
  3. Or approved equal.
- F. Putty: 3M Fire Protection Products: "3M MPS-2, MPP-4S Moldable Putty Stix & Pads"
1. The RectorSeal Corp.:
    - a. "Bio Fireshield Biostop Putty Sticks & Pads"
    - b. "Metacaulk Fire Rated Putty Sticks & Pads"
    - c. "Flamesafe FS 1000-1077-1100 Series"
  2. Or approved equal.
- G. Accessories:
1. Safing/Forming Materials (Compressible Filler): As required to comply with fire resistance ratings and as recommended by firestopping material manufacturer. Products specified as a basis of design include:
    - a. "Type SAF Thermafiber" by Owens Corning.
    - b. "FBX Safing Insulation" by Fibrex Insulations, Inc.
    - c. "Safing Insulation/MW" by Owens Corning.
    - d. "Paroc Safing Insulation" by Owens Corning.
    - e. "Delta Board, Delta-8, and Delta Safing Board" by Rock Wool Manufacturing Co.
  2. Primer, Sealant, Cleaner, and Similar Preparation Materials: As recommended by firestopping manufacturer.

## **2.3 MATERIALS**

- A. Refer to Contract Drawings for Fires-Rated walls and assemblies.
- B. Intumescent Latex-Based Caulk: Compound which expands on exposure to surface heat gain; conforming to following:

1. Provide in locations scheduled for painting where listed for required fire rating.
  2. 3M Fire Protection Products; Product CP 25WB.
- C. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
1. Provide in all other locations unless otherwise specified.
- D. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design.
- E. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
- F. Foam Firestopping: Single component from compound.
- G. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers.
- H. Firestop Devices: Mechanical device with incombustible filler and sheet stainless steel jacket.
- I. Intumescent Putty: Compound which expands on exposure to surface heat gain.
- J. Firestop Pillows: Formed mineral fiber pillows.
- K. Primers, Sleeves, Forms and Accessories: Type required for tested assembly design.

## **2.4 MIXING**

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products specified in this section are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Installer to confirm unsatisfactory conditions have been corrected / rectified and are acceptable to ensure a proper and timely installation of the proposed products. Verify the work when properly installed will meet the specified warranty requirements. Submit written confirmation to the General Contractor with copies to the Owner's Representative and Architect. Failure to



submit written confirmation and subsequent installation will indicate all conditions are acceptable to Installer / Contractor.

- C. Verify openings are ready to receive the work of this section.
- D. By beginning work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to Owner.

### **3.2 PREPARATION**

- A. Protection: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of construction and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.
- B. Surface Preparation: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
  - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
  - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation. Remove incompatible materials which may affect bond.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Prime substrates where recommended by firestopping manufacturer using manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
  - 5. Install backing materials to maintain firestopping materials where required.

### **3.3 INSTALLATION**

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published fire test reports and drawings for products and applications indicated and in accordance with manufacturer's instructions, completely closing openings.
  - 1. Do not cover installed firestopping until inspected by authority having jurisdiction.
- B. Install forming/damming/backing 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 firestop systems.
- C. Install fill materials for firestop systems 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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Fire-Resistive Joint Sealant Installation: Comply with requirements in "System Description - Performance Requirements" above and with sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
1. Install joint fillers to provide support of 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 and develop fire-resistance rating required.
  2. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provide for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at same time joint fillers are installed.
  3. Tool non-sag sealants immediately after sealant application and prior to time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- E. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. 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.

### **3.4 FIELD QUALITY CONTROL**

- A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

### **3.5 CLEANING**

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which the opening and joints occur.

### **3.6 PROTECTION**

- A. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 firestopping immediately and install new materials to produce firestopping complying with specified requirements.
- B. Dispose of debris and material legally and in accordance with local jurisdiction requirements.
- C. Comply with waste management and recycling program requirements.

END OF SECTION 078400

## **SECTION 079200 - JOINT SEALANTS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes, but is not limited to, the following: Joint Sealant Work to be complete within the construction:
  - 1. This project is a Phased construction type project, and as such there shall be work of this Section included in all Phases of construction to the extent required by contract drawings and or as required to install new work.
  
- B. Exterior Joint Sealants for:
  - 1. Vertical surfaces and non-traffic horizontal surfaces including (but not limited to):
    - a. At sheet metal flashing and trim areas.
    - b. At any other exterior joints not mentioned herein but required to prevent air and water from penetrating the exterior and interior area of the building.
  
- C. Interior Joint Sealants for:
  - 1. Vertical surfaces and horizontal non-traffic surfaces including but not limited to the following:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings at windows, doors, and vent openings and elsewhere indicated on Drawings.
    - c. Joints between tops of non-load-bearing unit masonry walls and underside of the structural floor deck.
    - d. Tile control and expansion joints at vertical corner joints and floor joints where floor meets vertical walls.
    - e. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
    - f. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
    - g. Perimeter joints of toilet fixtures.
    - h. Joints between exposed concrete structure and concrete masonry unit construction and gypsum board construction.
  
  - 2. Horizontal traffic surfaces including but not limited to :
    - a. Control and expansion joints in tile flooring including joints at intersection of floor and vertical wall.
  
  - 3. Other interior joints as indicated on Drawings.
  
- D. Non-Fire Rated Compressible Filler
  
- E. Related Sections:
  - 1. DIVISION 01
  - 2. DIVISION 03 – Cast-In-Place Concrete

3. DIVISION 04 – Unit Masonry
4. DIVISION 06 – Casework
5. DIVISION 07 – Sheet Metal and Flashing Systems
6. DIVISION 07 – Firestopping
7. DIVISION 08 – Doors and Opening Systems
8. DIVISION 09 – Finishes
9. DIVISION 10 – Specialties
10. DIVISION 12 – Furnishings
11. Mechanical, Electrical and Plumbing Sections

## **1.2 REFERENCES**

- A. Reference Standards: Comply with following, including but not limited to:
1. ASTM C 834 - Standard Specification for Latex Sealants;
  2. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications;
  3. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants;
  4. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
  5. ASTM D1667 – Standard specification for flexible cellular materials – vinyl chloride polymers and copolymers (closed-cell foam)

## **1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements
1. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

## **1.4 PERFORMANCE REQUIREMENTS**

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

## **1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 SUBMITTAL PROCEDURES and as modified below for product indicated.
1. Product Data: Submit manufacturer’s product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  2. Specified Products: Submit Product Data, Samples, Shop Drawings, and Quality Control Submittals identified below.
    - a. Color Samples: Submit full range of color samples for “Color Selection” by Architect.

3. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation below, comply with all requirements specified in "Product Data", "Samples", "Shop Drawings", and "Quality Control Submittals".
- B. Product Data: Submit manufacturer's specifications, recommendations and installation instructions for each type of joint sealant specified including accessory products. For each joint sealant indicated.
1. Submit joint sealant schedule indicating the product type, location, and system application.
  2. Test Reports: Submit compatibility and adhesion test reports in accordance with DIVISION 01.
- C. Samples:
1. Selection of color: Submit complete set of manufacturer's bead samples to be included in Mock-ups, consisting of strips of actual products, demonstrating manufacturer's full range of standard and custom colors available for each product for Architect's selection.
  2. Samples:
    - a. Submit samples for color selection: Submit manufacturer's full range of custom colors for selection to match adjacent surfaces. Final approval of color selections contingent upon Architect's written approval of Mock-up.
    - b. Submit samples of each type of joint sealer, gasket and sealant compound.
  3. Verification: Submit (3) - 12-inch long samples of each selected color for each type of joint sealant installed between 2 strips of material, similar to surfaces where sealant or compound will be used representing typical joint widths. Architect's review for color and texture only; compliance with specified requirements remains Contractor's exclusive responsibility.
  4. Manufacturer's Field Reports: Submit report after inspection of joint sealers to verify satisfactory conditions for start of installation and at mid-point and prior to completion, satisfactory installation procedures and precautions, and satisfactory completed installation.
    - a. Manufacturer's representative shall submit written report, after each visit, to Owner indicating conditions observed and any directives given to Contractor for repairing defective or non-complying work
- D. Quality Control Submittals:
1. Test Reports
    - a. Compatibility and Adhesion Test Reports: Submit reports from joint sealant manufacturer indicating materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with specified joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation required to obtain adhesion. Refer to Source Quality Control requirements noted below.
    - b. Product Test Reports: Submit product test reports for each type of joint sealants in accordance with requirements specified in Source Quality Control noted below.
      - 1) Submit product Sealant Waterproofing, and Restoration (SWR) Institute validation certificate.
  2. Certificates

- a. Compliance Certificate: Submit manufacturer's published data, letter of certification, or certified test laboratory report indicating that each joint sealant material complies with specified requirements and is appropriate for applications shown on Drawings and described in Project Manual.
  - b. VOC Content: Submit certification by joint sealant manufacturer indicating that joint sealant materials including primers and cleaners required for sealant installation comply with applicable Massachusetts regulations controlling use of volatile organic compounds (VOC).
  - c. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable) indicating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.
  - d. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years successful documented experience.
    - 1) Provide a written certification from the manufacturers of the adjacent systems certifying the proposed sealant product is compatible with the adjacent specified or existing systems including, but not limited to the following:
      - a) Aluminum window and door frame systems
      - b) Masonry products and systems
  - e. Installer Experience Listing: Company specializing in installation of the Products specified in this section with minimum five (5) years successful documented experience. Submit list of completed projects over the past five (5) years using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with applicable "Qualifications" requirements specified below.
- E. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
1. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
- F. Contract Closeout Submittals: Comply with Division 1 specifications and MNR "Terms and Conditions"
- G. Preconstruction field test reports of materials installed in sample mockup panels.
- H. Compatibility and adhesion test reports.
- I. Product certificates and test reports.
- 1.6 QUALITY ASSURANCE**
- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 and ASTM C 794 and or the manufacturer's standard test method to determine

whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1. **Preconstruction Field-Adhesion Testing:** Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.
- B. **Pre-installation Compatibility and Adhesion Testing:** Test elastomeric sealants and accessories with samples of each joint substrate material for compatibility, adhesion, and freedom from staining. Include recommendations for substrate preparation and primers for proper adhesion, and solvents for cleaning.
- C. **Mockups:** Build mockups as directed by Architect, incorporating sealant joints, as follows, to verify selections made as part of this specification under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
  1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- D. **Qualifications:**
  1. **Manufacturer Qualifications:** Company specializing in manufacturing the Products specified in this section with minimum five (5) years of successful documented experience.
  2. **Installer:** Experienced installer who has completed joint sealant applications similar in material, design, and extent to that indicated for this Project that have resulted in construction with a record of successful in-service performance. For 5 years with successful Project.
  3. **Contractor/Manufacturer Testing Laboratory:** Independent testing laboratory acceptable to Owner, complying with requirements of ASTM E699, and having experience and capability to conduct satisfactorily testing indicated without delaying progress of Project.
- E. **Certifications:**
  1. **Statement of Non-Compliance:** When necessary to proceed with joint sealer installation under conditions not fully complying with specified requirements or manufacturer's recommendations because of time schedule difficulties or other reasons Installer determines to be crucial to Project and approved by Architect, prepare written statement for Owner's record (with copies to the Prime Contractor and Architect) indicating:
    - a. Nature of non-compliance
    - b. Reasons for proceeding
    - c. Extra or precautionary measures taken to ensure best possible installation, and
    - d. Names of individuals concurring with decision to proceed with installation.
    - e. Submit notice that warranty will still be issued with full compliance.
    - f. If warranty cannot be issued than materials shall be removed and put in correctly.

## **1.7 MOCK-UP**

- A. Include sealant joints in exterior mock-up panel in conjunction with precast concrete, masonry work, window, and walls, and others as herein indicated in the project manual.
  1. Construct mock-up with specified sealant types, colors and with other components noted. Final approval of color selections contingent upon the Architect's written approval of mock-ups.
  2. Locate where directed by Architect.



3. Approved mock-up may remain as part of the Work upon prior written approval of Architect.

#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver materials to Site in original un-opened containers of bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Storage and Protection: Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminates, or other causes.

#### **1.9 PROJECT/SITE CONDITIONS**

- A. Environmental Requirements - Do not proceed with joints sealant installation when ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or below 40 deg. F. and when joints substrates are wet.
  1. Do not proceed with installation of sealants during inclement weather unless all requirements and manufacturer's instructions can be complied with. Do not proceed with installation of sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width, nor when such extreme temperatures or heavy wind loads are forecast during the period required for initial or nominal cure of elastomeric sealants. Whenever possible, schedule the installation and cure of elastomeric sealants during periods of relatively low temperatures (but well within manufacturer's recommended range) so that subsequent tensile stresses upon the cured sealants will be minimized.
- B. Project Conditions:
  1. Joint Width Conditions: Do not proceed with joint sealant installation where joint widths are less than allowed by joint sealant manufacturer for application indicated on Drawings.
  2. Joint Substrate Conditions: Do not proceed with joint sealant installation until contaminants capable of interfering with their adhesion are removed from joint substrates. Surfaces must be clean, dry, and free of contaminants.

#### **1.10 COORDINATION**

- A. Coordinate the work with all systems requiring joint sealants and sections referencing this specification section.

#### **1.11 SEQUENCING AND SCHEDULING**

- A. Sequence joint sealant installation to occur not less than 21 or more than 30 days after completion of waterproofing, unless otherwise indicated.

#### **1.12 WARRANTY**

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
- B. Provide five (5) year written warranty covering correction of defective work within a five year period after Date of Substantial Completion.
  - 1. Warranty: Repair or replace sealants which fail to perform as air-tight and water-tight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, color retention, or general durability; or appear to deteriorate in any manner not clearly specified as inherent quality of material by submitted manufacturer's data.
  - 2. Warranty Period: Five (5) years from date of Substantial Completion. Warranty shall be signed jointly and severally by the General Contractor and Installer for five (5) years from date of Substantial Completion
- C. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Ten (10) years for silicones and five (5) years for urethanes from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Provide only sealants and joint primers which are compatible with joint surfaces and backing or filler materials, as stated in the manufacture's published data, or as certified by manufacturer for each application.
- B. Provide sealants having lowest modulus of elasticity which is consistent with degree of exposure to wear, abrasion, and vandalism. Any sealant exposed to traffic must have strength and modulus sufficiently high to resist damage by traffic, indentation.
- C. For fully concealed joints, provide manufacturer's standard color of sealant or caulking compound which has best overall performance characteristics for application shown.
- D. For exposed joints provide colors as selected by Architect from manufacturers full line of standard and custom colors for each product specified.

### **2.2 MANUFACTURERS**

- A. As a basis of design, details and specifications have been based on specified products by following manufacturers:
  - 1. Pecora Corp., Harleysville, Pennsylvania.
  - 2. Other acceptable manufacturers upon a compliance review may include the following:
    - a. Crafcoc, Chandler, Arizona.
    - b. Bayer Corp., Pittsburgh, Pennsylvania.
    - c. PSI, Elverson, Pennsylvania.
    - d. ChemRex Inc. /Sonneborn Building Products Division, Shakopee, Minnesota.
    - e. Tremco Inc., Beachwood, Ohio.
    - f. Dow Corning, Midland, Michigan.

- g. Sika Corporation, Lyndhurst, New Jersey
  - h. Note: Sealant Manufacturer Selection: Provide written certification from manufacturers of adjacent systems certifying the proposed sealant product is compatible with the existing exterior systems at each project location. See 2.3 below.
- B. Single Source Responsibility: Obtain joint sealants from single source manufacturer.
  - C. Products: Subject to compliance with requirements listed below. Provide one of the products listed in other Part 2 articles.

### **2.3 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 sealant manufacturer, based on testing and field experience.
  - 1. Provide a written certification from the manufacturers of the adjacent systems certifying the proposed sealant product is compatible with the adjacent other specified or existing systems including, but not limited to the following:
    - a. Aluminum window and door frame systems
    - b. Masonry products and systems
    - c. Roofing systems
    - d. Finish products
    - e. Precast Concrete
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of colors for specified products.

### **2.4 ELASTOMERIC JOINT SEALANTS**

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied moisture or chemical curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use with joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

### **2.5 PRODUCTS**

- A. Elastomeric Joint Sealants: Manufacturer's standard moisture curing elastomeric sealants that comply with ASTM C920 and other requirements indicated below, including ASTM C920 requirements for Type, Grade, Class and Use.
1. Final approval and color selection contingent on Architect's written approval of mock-up panel.
  2. Multi-Part Pourable Urethane Sealants (ES-1)
    - a. Location: Exterior/interior joints 1/4 inch to 2 inches wide in traffic-bearing horizontal surfaces of concrete and between metal and concrete, mortar, stone and masonry.
    - b. Products complying with these requirements include
      - 1) "SL 2 Self-Leveling and Slope-Grade Sealant" by Sonneborn/ChemRex Inc.
      - 2) "Chem-Calk 550 Two-Component Polyurethane" by Bostik
      - 3) "NR-200 Urexpand/Dynatred" by Pecora Corp.
      - 4) "THC-900/901 Self-Leveling Expansion Joint Sealant" by Tremco.
  3. Single-Part Gun-Grade Urethane Sealants (ES-4)
    - a. Location: Exterior/interior joints 1/4 inch to 1 inch wide or less in traffic-bearing horizontal surfaces of concrete and between metal and concrete, mortar, stone and masonry.
    - b. Products complying with these requirements include:
      - 1) "SL 1 One-Part Self-Leveling Sealant" by Sonneborn/ChemRex Inc.
      - 2) "Chem-Calk 950 One-Component Polyurethane" by Bostik
      - 3) "NR-201 Urexpand" by Pecora Corp.
      - 4) "Tremflex S/L" "Vulkem 45 SSL" by Tremco.
  4. Single-Part Neutral-Curing Silicone Sealants (ES-5)
    - a. Location - Exterior/interior joints in horizontal and vertical surfaces of:
      - 1) Concrete and masonry.
      - 2) Between concrete masonry and stone.
      - 3) Between metal and concrete, mortar, or stone.
      - 4) Interior and exterior perimeter joints of metal window and curtainwall framed systems in exterior wall.
      - 5) Exterior overhead joints.
    - b. Products complying with these requirements include:
      - 1) "Pecora 890-NST/ 890FTS / 890FTS-TXTR" Silicone Sealants" by Pecora Corp.
      - 2) "Dow Corning 790 Silicone Building Sealant" by Dow Corning.
      - 3) "Spectrem 1" by Tremco.
    - c. Color Selections: Selected by Architect from full range of standard colors and field tinted colors.
  5. Single-Part Mildew-Resistant Silicone Sealants (Type ES-6)
    - a. Location: Interior joints in vertical surfaces of ceramic tile in toilet rooms, showers, and kitchens.

- b. Products complying with these requirements include:
  - 1) "Pecora 898NST Silicone Sanitary Sealant" by Pecora Corp.
  - 2) "Dow Corning 786 Mildew-Resistant Silicone Sealant" by Dow Corning
  - 3) "Sanitary 1700 Silicone Sealant" by GE Silicone.
  - 4) "TREMsil 200" by Tremco, Inc.
- 6. Multi-Part Flexible Epoxy Control Joint Filler (ES-7)
  - a. Location: Saw-cut and formed control joint (contraction joint) in interior slabs-on-grade that remains exposed in finished building, approx. 1/4 inch wide.
  - b. Products complying with these requirements include:
    - 1) "Epolith-P" by Sonneborne/ChemRex Inc.
    - 2) "Sikadur 51 NS/SL" by Sika Corp.
    - 3) "Dynapoxy EP-800" by Pecora Corp.

## **2.6 ACRYLIC LATEX JOINT SEALANTS**

- A. Latex Joint Sealants: Manufacturer's standard one-part, non-sag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
  - 1. Acrylic-Emulsion Sealants (LS-1): Sealant complying with ASTM C834 that accommodates joint movement of not more than 5 percent in both extension and compression for total of 10 percent.
    - a. Locations:
      - 1) Interior joints in field-painted vertical and overhead surfaces at perimeter of elevator door frames and hollow metal door frames.
      - 2) Interior joints in gypsum board, plaster, concrete and masonry.
      - 3) Other interior joints not otherwise specified.
    - b. Products complying with these requirements include:
      - 1) "AC-20" by Pecora Corp.
      - 2) "Sonolac General Purpose Gun-Grade" by Sonneborn/ChemRex Inc.
      - 3) "Tremco Acrylic Latex" by Tremco, Inc.
      - 4) "Chem-Calk 600 One-Component Acrylic-Latex" by Bostik.

## **2.7 ACOUSTICAL JOINT SEALANTS**

- A. Acoustical Sealant for Concealed Joints AS-1: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
  - 1. Products:
    - a. Pecora Corporation; BA-98 Acoustical Sealant.
    - b. Tremco; Tremco Acoustical Sealant.

## **2.8 TAPE SEALANTS**

- A. Tape Sealants (TS): Manufacturer's standard, solvent-free, butyl-based tape sealant with solids content of 100 percent formulated to be non-staining, paintable, and non-migrating in contact

with non-porous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with release paper on one side. Products complying with these requirements include:

1. "Extru-Seal Tape" by Pecora Corp.
2. "PTI 606" by H.B. Fuller Company.
3. "Tremco 440II Tape" by Tremco, Inc.

## **2.9 PREFORMED JOINT SEALANTS**

- A. Preformed Foam Sealant (PS-1): Manufacturer's standard mildew-resistant, non-migratory, non-staining, preformed, pre-compressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent.
1. Products:
    - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
    - b. Sandell Manufacturing Co., Inc.; Polyseal.
    - c. Willseal Illbrouk Tremco, Inc.
    - d. Density: 8-16 lb/cu. ft.

## **2.10 JOINT-SEALANT BACKING**

- A. General: Provide sealant backings of material and type that are non-staining; 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 per ASTM requirements.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of materials indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
1. Closed-cell polyethylene foam, non-absorbent to liquid water and gas, non-outgassing in un-ruptured state, or open cell polyurethane backer rod as approved by sealant manufacturer for use with their products.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, 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.
- E. Compressible Filler - Non-Fire Rated Applications
1. Applications Exposed to View - Closed cell neoprene expansion joint filler in appropriate size and dimensions to use for joint width similar to:
    - a. "#NS - Closed Cell Neoprene Sponge" by Hohmann & Barnard, Inc.
    - b. "Rapid Soft-Joint/Expansion Joint" by Dur-O-Wall, Inc.
    - c. "Sandell Closed Cell Neoprene" by Sandell Manufacturing Co., Inc.

2. Concealed Applications: Fiberglass batt insulation, mineral wool batt insulation, or similar material acceptable to Architect.

## **2.11 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: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## **2.12 SOURCE AND FIELD QUALITY CONTROL**

- A. Testing - Manufacturer Through Prime Contractor
  1. Preconstruction Compatibility and Adhesion Testing: Provide joint sealant manufacturers with samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below. Schedule sufficient time for testing and analysis or results to prevent delay in progress of Project.
    - a. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    - b. Provide not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
    - c. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
  2. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by qualified independent testing laboratory on current product formulations within 24-month period preceding date of Contractor's submittal of test results to Architect.
    - a. Test elastomeric sealants for compliance with specified requirements by reference to ASTM C920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

## **2.13 FIRESTOPPING SEALANTS**

- A. Refer to Division 07 – Fire Resistive Joint Systems for sealants to be used.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which joint sealants are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Architect in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Prime Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Verify compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealant performance.

#### **3.2 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, 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.
  - 2. Remove laitance and form-release agents from concrete.
    - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 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**

- A. Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where 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. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. 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.  
Compressible Filler: Insert compressible filler material in locations indicated on Drawings to completely fill voids. Provide multiple layers of compressible filler materials where required.

### **3.4 FIELD QUALITY CONTROL**

- A. Field Adhesion Test: Before beginning installation of elastomeric joint sealants, install trial joint sealant in each type of substrate material and condition. After manufacturer recommended curing, conduct hand pull test at each trial joint sealant application.

1. Make horizontal knife cut across joint and two – (2) inch long cuts from crosscut parallel to joint at edges.
  2. Grasp (2) inch long piece of sealant and pull down at 90degree angle and try to pull sealant out of joint.
  3. If sealant does not adhere to joint sides, take measures to improve adhesion and retest.
  4. Re-seal cut trial areas.
- B. Testing: Water test exterior joint sealers in accordance with AAMA 501.2. Take remedial measures and re-test until watertight.

### **3.5 CLEANING AND PROTECTION**

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur. Do not damage adjoining surfaces or finishes.
- B. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from constructions operations or other causes so that they 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 that installations with repaired areas are indistinguishable from original work.
- C. Dispose of all waste legally and in accordance with local jurisdiction requirements.
- D. Comply with waste management and recycling program requirements.

### **3.6 CURING AND PROTECTION OF FINISHED WORK**

- A. Curing: Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. Advise General Contractor of procedures required for protection of sealants during construction period, so that they will be without deterioration or damage (other than normal weathering) at time of acceptance.
- C. Protect all adjacent surfaces from damage.
- D. Clean soiled surfaces immediately.
- E. Replace any damaged material which cannot be cleaned with new material.

END OF SECTION 079200

## **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. Hollow metal interior standard steel doors and frames.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware"

#### **1.3 DEFINITIONS**

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

#### **1.4 COORDINATION**

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

#### **1.5 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **1.6 ACTION SUBMITTALS**

- A. Shop Drawings: Include the following:
  - 1. Elevations of each door type.

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 electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

## **1.7 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For door inspector.
  1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
  2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
  3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly fire-rated borrowed-lite assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.
- D. Field quality control reports.

## **1.8 CLOSEOUT SUBMITTALS**

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

## **1.9 QUALITY ASSURANCE**

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
  1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

#### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non vented plastic.
  1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- 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. Apex Industries, Inc.
  2. Ceco Door; ASSA ABLOY.
  3. Curries Company; ASSA ABLOY.
  4. Custom Metal Products.
  5. Fleming Door Products Ltd.; Assa Abloy Group Company.
  6. Pioneer Industries.
  7. Steelcraft; an Allegion brand.

#### **2.2 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
  1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

### **2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES**

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A. [At locations indicated in the Door and Frame Schedule]
  1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Uncoated steel sheet, minimum thickness of 0.067 inch.
    - d. Edge Construction: Model 1, Full Flush.
    - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
    - f. Core: Polyurethane
    - g. Fire-Rated Core: Manufacturer's standard core for fire-rated and temperature-rise-rated doors.
  2. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.067 inch.
    - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Full profile welded.
  3. Exposed Finish: Prime in Factory.

### **2.4 BORROWED LITES**

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

**2.5 HOLLOW-METAL PANELS**

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

**2.6 FRAME ANCHORS**

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

**2.7 MATERIALS**

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than **25** percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- F. 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 hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."

## **2.8 FABRICATION**

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, 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.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.



## **2.9 STEEL FINISHES**

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## **PART 3 - EXECUTION**

### **3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

### **3.2 INSTALLATION**

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: 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 without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  - 2. Fire-Rated Openings: Install frames according to NFPA 80.
  - 3. Floor Anchors: Secure with post-installed expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
  - 4. Solidly pack mineral-fiber insulation inside frames.
  - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.

6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames 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 and adjust hollow-metal doors accurately in frames, within clearances specified below.
  1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
  1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.

### **3.4 REPAIR**

- A. 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.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

## **SECTION 081416 - FLUSH WOOD 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. Seven-ply flush wood veneer-faced doors for transparent finish.
  - 2. Fire-rated wood door frames.
  - 3. Factory finishing flush wood doors.
  - 4. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
  - 1. Section 088000 "Glazing" for glass view panels in flush wood doors.
  - 2. Section 099123 "Interior Painting" for field finishing doors.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product, including the following:
  - 1. Door core materials and construction.
  - 2. Door edge construction
  - 3. Door face type and characteristics.
  - 4. Factory-finishing specifications.
- B. Sustainable Design Submittals:
  - 1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
  - 1. Door schedule indicating door location, type, size, fire protection rating, and swing.
  - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.

3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  4. Dimensions and locations of blocking for hardware attachment.
  5. Dimensions and locations of mortises and holes for hardware.
  6. Clearances and undercuts.
  7. Requirements for veneer matching.
  8. Doors to be factory finished and application requirements.
  9. Coordinate with Hollow metal door and frame schedule and security system door hardware and controls.
  10. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. Sample Warranty: For special warranty.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Special warranties.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

## **1.8 FIELD CONDITIONS**

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

## **1.9 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Delamination of veneer.
    - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Source Limitations: Obtain flush wood doors from single manufacturer.

### **2.2 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

### **2.3 FLUSH WOOD DOORS, GENERAL**

- A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."
  - 1. Provide labels certificates from AWI certification program indicating that doors comply with requirements of grades specified.
  - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

### **2.4 SEVEN-PLY FLUSH WOOD VENEER-FACED DOORS[ AND TRANSOM PANELS] FOR TRANSPARENT FINISH**

- A. Interior Doors :
  - 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. ABS-American Building Supply, Inc.
    - b. General Veneer Manufacturing Co.
    - c. Haley Brothers, Inc.
    - d. Lambton Doors.
    - e. Oregon Door.
    - f. Vancouver Door Company.
  - 2. Architectural Woodwork Standards Grade: Custom.
  - 3. Faces: two-ply wood panel with wood veneer not less than 1/50 inch thick.
    - a. Species: Select white birch .
    - b. Cut: Plain sliced (flat sliced).
    - c. Match between Veneer Leaves: Slip match.
    - d. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  - 4. Exposed Vertical and Top Edges: Same species as faces - Architectural Woodwork Standards edge Type A .

- a. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
  - b. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
5. Core for Non-Fire-Rated Doors: ANSI A208.1, Grade LD-1 particleboard.
- a. Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
6. Core for Non-Fire-Rated Doors: WDMA I.S. 10 structural composite lumber.

## **2.5 LIGHT FRAMES AND LOUVERS**

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
1. Wood Species: Same species as door faces.
  2. Profile: Flush rectangular beads.
  3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings.

## **2.6 FABRICATION**

- A. Factory fit doors to suit frame-opening sizes indicated.
1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
1. Locate hardware to comply with DHI-WDHS-3.

2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels:

1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
3. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.

1. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

## **2.7 FACTORY FINISHING**

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Finish: Architectural Woodwork Standards System-5, Varnish, Conversion.
2. Staining: As selected by Architect from manufacturer's full range to match existing. Closed Grain.
3. Sheen: Semigloss.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine doors and installed door frames, with Installer present, before hanging doors.



1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
  2. Anchor frames to anchors or blocking built in or directly attached to substrates.
    - a. Secure with countersunk, concealed fasteners and blind nailing.
    - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
      - 1) For factory-finished items, use filler matching finish of items being installed.
  3. Install fire-rated doors and frames in accordance with NFPA 80.
  4. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
    - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
  2. Machine doors for hardware.
  3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  4. Clearances:
    - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
    - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
    - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    - d. Comply with NFPA 80 for fire-rated doors.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

### **3.4 ADJUSTING**

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION 081416**

## **SECTION 083113 - ACCESS DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
  - 1. Access doors and frames at wall and ceiling locations where required to access control valves and other mechanical electrical and plumbing devices.
  - 2. Provide in hard construction including walls and ceilings as directed by the Architect and Engineer in the field.
  
- B. Related Sections:
  - 1. DIVISION 04: Masonry Restoration: Masonry walls receiving access doors.
  - 2. DIVISION 09: Painting: Finish painting of access doors.
  - 3. DIVISION 09: Gypsum Board Assemblies.
  - 4. Mechanical Work: Refer to access doors related to mechanical equipment.
  - 5. Electric Work: Refer to access doors related to electrical equipment.
  - 6. Miscellaneous renovation work

#### **1.2 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 SUBMITTAL PROCEDURES.
  
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: For each type of access door required provide a submittal with a location drawing, type of door, size, and finish.
  
- C. Coordination Drawings: Drawn to scale and coordinating access door and frame installation with ceiling support, ceiling-mounted items, finish work, tiling and concealed work above ceiling. Provide location drawing locating all access doors above and below ceiling. Minimum 1/8 inch=1'-0". Provide necessary details at not less than 3 inches equals 1-foot scale and show all anchorage and accessory items and finishes. Indicate detention grade access doors.
  
- D. Shop Drawings: Submit shop drawings for fabrication and installation of access doors not fully described by manufacturer's data sheets. Include plans and elevations at not less than 1-inch equals 1foot scale, and necessary details at not less than 3 inches equals 1-foot scale and show all anchorage and accessory items and finishes.
  
- E. Provide the manufacturer's standard-size samples. Revise access door sizes to suit the project application and constraints encountered in the field. Utilize the largest size possible to promote access, utility, and maintenance of devices while meeting the aesthetic requirements established by the Architect. Provide a schedule noting location, layout, and sizes for review by Architect and Engineer.
  
- F. Provide coordination shop drawing showing location of access doors, size, and construction elements the door will be installed within including coordination with adjacent elements and finishes. Final size and location of access doors to be coordinated with Architect and Engineer prior to installation of work. Final size to be approved by Architect and Engineer prior to installation.
  
- G. Samples: For each exposed finish.
  
- H. Schedule: Door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
  
- I. Comply with recycling program and waste management procedures.

- J. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
1. Requirements of DIVISION 01 CLOSEOUT PROCEDURES.

### **1.3 PROJECT / SITE CONDITIONS**

- A. Field Measurements: Verify dimensions by field measurements before fabrication without delaying Project.
- B. Final size and location of access doors to be coordinated with Architect and Engineer prior to installation of work.

### **1.4 SEQUENCING AND SCHEDULING**

- A. Access Doors for Heating and Plumbing Work:
1. Unless otherwise indicated on Drawings or specified in MECHANICAL DIVISIONS, provide access doors to gain access to concealed conditions as required for the work as directed by the Architect or Engineer in the field. Access doors and frames for Heating Work and Plumbing Work Contracts shall be provided and installed as part of Heating or Plumbing Work Contract.
  2. Ensure access doors in Heating Work Contract are installed by trades experienced in installation of access doors in applicable types of adjacent construction and comply with requirements specified in this specification.
- B. Access Doors for Electric Work:
1. Unless otherwise indicated on Drawings or specified in ELECTRICAL DIVISION, provide access doors and frames to gain access to concealed conditions as required for the work as directed by the Architect or Engineer in the field. Access doors and frames for Electric Work Contract shall be provided and installed as part of Electric Work Contract.
  2. Ensure access doors in Electric Work Contract are installed by trades experienced in installation of access doors in applicable types of adjacent construction and comply with requirements specified in this specification.

### **1.5 QUALITY ASSURANCE**

- A. Fire-Rated Access Doors and Frames: Where required to maintain a code compliant fire rated assembly provide units complying with NFPA 80 and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction per test method indicated.
1. Vertical Access Doors: NFPA 252 or UL 10B as required by Governing agency.
  2. Horizontal Access Doors and Frames: ASTM E 119, UBC Standard 7.1, or UL 263.
- B. Size and Location Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment and indicate on schedule. Final size to be approved by Architect and Engineer prior to installation.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
1. Hot-Dip Galvanized Steel: Coat to comply with ASTM A 123/A 123M for steel and iron products and ASTM A 153/A 153M for steel and iron hardware.
  2. Stainless Steel where indicated or required by corrosive conditions such as toilet, shower rooms, and mechanical rooms.

- B. Steel Sheet:
1. Hot-Rolled: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled.
  2. Cold-Rolled: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
    - a. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
  3. Electrolytic Zinc Coated: ASTM A 591/A 591M, Commercial Steel (CS), with Class C coating and phosphate treatment to prepare surface for painting.
  4. Metallic Coated: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness.
  5. Stainless Steel at wet locations.
- C. 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 the strength and durability properties of alloy 5005-H15.
- D. First paragraph below specifies minimum yield point of 30 ksi (205 Mpa); revise if higher strength is required.
- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
- G. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.
- H. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum panels indicated.
- I. Plaster Bead: Casing bead formed from 0.0299-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.
- J. Paint:
1. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide sound foundation for field-applied topcoats despite prolonged exposure.
  2. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
  3. Delete below if no metallic-coated steel fabrications.
  4. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

## 2.2 ACCESS DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
1. Milcor Limited Partnership.
  2. Karp Associates, Inc.
  3. Mifab
  4. Or approved equal.

## 2.3 PRODUCTS:

- A. As a basis of design, details and specifications have been based on specified products by the following manufacturers:
1. Milcor Limited Partnership, Lima, Ohio.

2. Karp Associates Inc., Maspeth, New York.
3. Larsen's Manufacturing Co.,
4. Mifab
5. Or approved equal.

## **2.4 STEEL ACCESS DOORS**

- A. Flush Doors - Drywall Framed Ceiling or Wall
1. Material: 16-gauge steel frame with 14-gauge door panel and galvanized steel drywall bead.
  2. Finish: Baked-on electrostatic powder prime coat chemically bonded to steel.
  3. Hinge: Concealed spring hinge or concealed continuous piano hinge.
  4. Lock: Flush, screwdriver-operated with steel cam.
  5. Similar to:
    - a. "Milcor DW Access Door" by Milcor Limited Partnership.
    - b. "KDW Access Door" by Karp Associates Inc.
    - c. "UA Series" by Mifab
    - d. Or approved equal
- B. Flush Doors - Drywall, Masonry, or Tile Wall
1. Material:
    - a. Prime paint finish: 14-gauge steel frame and door panel.
    - b. Stainless steel finish: 16-gauge stainless steel frame and door panel.
    - c. Material finish as selected by architect in submittals.
  2. Finish:
    - a. Prime paint finish: Factory-applied, electrostatic bonded, ionized, thermoset powder paint.
    - b. Stainless steel finish: Satin finish.
    - c. Material finish as selected by architect in submittals.
  3. Hinge: Concealed spring hinge or concealed continuous piano hinge.
  4. Lock: Flush, screwdriver-operated with steel cam.
  5. Similar to:
    - a. Prime Paint Finish:
      - 1) "Milcor M Access Door" by Milcor Limited Partnership.
      - 2) "DSC-214M Universal Access Door" by Karp Associates Inc.
      - 3) "UA Series" by Mifab
      - 4) Or approved equal
    - b. Stainless Steel Finish: "Milcor MS Access Door by Milcor Limited Partnership.
    - c. Or approved equal
- C. Flush Doors - Walls and Ceilings (with casing bead)
1. Material: 16-gauge steel frame with 14-gauge door panel and 22-gauge galvanized casing beads.
  2. Finish: Baked-on electrostatic powder prime coat chemically bonded to steel.
  3. Hinge: Concealed spring hinge or concealed continuous piano hinge.
  4. Lock: Flush, screwdriver-operated with steel cam.
  5. Similar to:
    - a. "Milcor K Access Door" by Milcor Limited Partnership.
    - b. "DSC-214PL Access Door" by Karp Associates Inc.
    - c. "CAD-FL-PL Access Door" by Mifab
    - d. Or approved equal

- D. Recessed Doors - Suspended Acoustical tile Ceilings (in existing locations requiring modification)
1. Material: 16-gauge steel frame with 18-gauge recessed steel door panel; 24-inch x 24-inch panels and larger reinforced.
  2. Finish: Baked on electron powder prime coat chemically bonded to steel: white, rust inhibitive prime coat on exposed edges.
  3. Hinge: continuous steel hinge with stainless pin; mounted on long side of rectangular doors.
  4. Lock: Flush, screwdriver-operated with steel cam.
  5. Similar to:
    - a. "Milcor AT Access Door" by Milcor Limited Partnership.
    - b. "KATR Access Door" by Karp Associates Inc.
    - c. "CAD-FR" by Mifab
    - d. Or approved equal
- E. Fire-Rated Doors- Drywall Stud and Masonry Walls (in existing locations requiring modification)
1. Material: 16-gauge steel frame with 20-gauge steel door panel; same for both prime painted doors and stainless-steel doors. Finish material selected by Architect based on location of access door.
  2. Finish:
    - a. Prime paint finish: Factory-applied, electrostatic bonded ionized, thermoset power paint.
    - b. Stainless steel finish: Satin finish.
    - c. Or approved equal
  3. Hinge: Continuous steel hinge with stainless steel pin; includes automatic panel closer.
  4. Lock: Self-latching with direct action knurled knob and interior latch release mechanism.
  5. Similar to:
    - a. "Milcor Fire Rated Door" by Milcor Limited Partnership.
    - b. "KRP-150FR Insulated Fire Rated Access Door" by Karp.
    - c. "MPFR" by Mifab
    - d. Or approved equal
- F. Fabrication
1. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
    - a. Other devices available include pull rings, Allen head, Phillips head, spanner head, tee handle, push button, and thumb turn.
    - b. For cylinder lock, furnish two keys per lock and key all locks alike.
    - c. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
  2. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which access doors are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractors in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written

confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

- C. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.
- D. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- E. Install access doors, flush with adjacent finish surfaces or recessed to receive finish material.
- F. Adjust doors and hardware after installation for proper operation.
- G. Install access doors rigid, straight, plumb and level. Secure to supporting walls with manufacturer's recommended anchoring devices, as shown on final shop drawings or in manufacturer's instructions.
- H. Conceal all drilling, cutting, and fitting to room finish.
- I. Adjust and lubricate hardware for proper operation after installation.

### **3.2 PROTECTION**

- A. Protect units during delivery, storage and after installation; replace damaged units as directed by Architect.
- B. Perform final adjustments to door hardware and other operating parts prior to final inspection. Clean exposed surfaces and touch up minor scratches and other finish imperfections using materials and methods recommended by manufacturer.
- C. Comply with waste management and recycling program requirements.
- D. Dispose of materials legally and in accordance with local jurisdiction requirements.

END OF SECTION - 083113



**SECTION 084523 - 2-3/4" INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL WALL SYSTEM**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
  - 1. Flat factory prefabricated structural insulated translucent sandwich panels
  - 2. Aluminum installation system
  - 3. Aluminum sill flashing
  
- B. Related Sections:
  - 1. Division 03 - Concrete
  - 2. Division 04 - Unit Masonry
  - 3. Division 05 - Structural Steel
  - 4. Division 06 - Rough Carpentry
  - 5. Division 07 - Flashing and Sheet Metal
  - 6. Division 07 - Joint Sealants
  - 7. Division 08 - Glazing

**1.2 SUBMITTALS**

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
  
- B. Submit shop drawings. Include elevations and details.
  
- C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
    - a. Sandwich panels: 14" x 28" units
    - b. Factory finished aluminum: 5" long sections
  
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
  
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current

products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required are:
  - a. International Building Code Evaluation Report
  - b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
  - c. Burn Extent (ASTM D 635)
  - d. Color Difference (ASTM D 2244)
  - e. Impact Strength (UL 972)
  - f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
  - g. Bond Shear Strength (ASTM D 1002)
  - h. Beam Bending Strength (ASTM E 72)
  - i. Insulation U-Factor (NFRC 100)
  - j. NFRC System U-Factor Certification (NFRC 700)
  - k. Solar Heat Gain Coefficient (NFRC or Calculations)
  - l. Condensation Resistance Factor (AAMA 1503)
  - m. Air Leakage (ASTM E 283)
  - n. Structural Performance (ASTM E 330)
  - o. Water Penetration (ASTM E 331)
  - p. 1200°F Fire Resistance (SWRI)

### **1.3 QUALITY ASSURANCE**

#### **A. Manufacturer's Qualifications**

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as issued by the ICC-ES.

- B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

### **1.4 PERFORMANCE REQUIREMENTS**

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. Standard panel system shall have less than 0.01 cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
2. Structural Loads; Provide system capable of handling the following loads:
  - a. Wind Load: 16 PSF

## **1.5 DELIVERY STORAGE AND HANDLING**

- A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## **1.6 WARRANTY**

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within five years of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURER**

- A. The following is noted as the basis of design:
  1. Kalwall Corporation; Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: [info@kalwall.com](mailto:info@kalwall.com).
- B. Other manufacturers may include the following pending submittal of the performance requirements noted in this specification:
  1. Major Industries
  2. Structures Unlimited, Inc.
  3. Distinctive Skylights, Inc.
  4. Or approved equal

### **2.2 PANEL COMPONENTS**

- A. Face Sheets
  1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
    - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
    - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
  2. Interior face sheets:

- a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 250 when tested in accordance with UL 723.
  - b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
- a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
  - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand-held pencil and repel an impact minimum of **70 ft. lbs.** without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
4. Appearance:
- a. Exterior face sheets: Smooth .070" thick and Crystal in color.
  - b. Interior face sheets: Smooth .045" thick and Crystal in color.
  - c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.
- B. Grid Core
1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
  2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite. Poured and de bridged is unacceptable.
- C. Laminate Adhesive
1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
  2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
  3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
    - a. 50% Relative Humidity at 68° F: 540 PSI
    - b. 182° F: 100 PSI
    - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
    - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

### **2.3 PANEL CONSTRUCTION**

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
  - 1. Thickness: 2-3/4"
  - 2. Light transmission: 35%
  - 3. Solar heat gain coefficient 0.29.
  - 4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid 0.23 "u".
  - 5. Complete insulated panel system shall have NFRC certified U-factor of 0.28 "u".
  - 6. Grid pattern: Refer to elevations for grid pattern as approved by the Architect.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.
- C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.
- D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

### **2.4 BATTENS AND PERIMETER CLOSURE SYSTEM**

- A. Closure system: Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish:
  - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's full range of standards.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Installer shall examine substrates, supporting structure and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### **3.3 INSTALLATION**

- A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
  1. Anchor component parts securely in place by permanent mechanical attachment system.
  2. Accommodate thermal and mechanical movements.
  3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### **3.4 CLEANING**

- A. Clean the panel system interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 084523

## **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.
- 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 06 Section “Rough Carpentry”.
  - 2. Division 06 Section “Finish Carpentry”.
  - 3. Division 08 Section “Hollow Metal Doors and Frames”.
  - 4. Division 08 Section “Flush Wood Doors”.
  - 5. “Access Control Hardware Devices” – conduit rough-in and back box for all new card readers to be provided and installed by Contractor and final wiring and termination of card reader devices to be installed by County vendor.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code NJ Edition.
  - 3. NJUCC and Rehabilitation Code.
  - 4. NFPA 70 - National Electrical Code.
  - 5. NFPA 80 - Fire Doors and Windows.
  - 6. NFPA 101 - Life Safety Code.
  - 7. NFPA 105 - Installation of Smoke Door Assemblies.
  - 8. State Building Codes, Local Amendments.

- E. 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. ULC-S319 - Electronic Access Control Systems.
  5. ULC-60839-11-1, Alarm and Electronic Security Systems - Part 11-1: Electronic Access Control Systems - System and Components Requirements.
  6. UL 305 – Panic Hardware.
  7. ULC-S132, Emergency Exit and Emergency Fire Exit Hardware.
  8. ULC-S533 – Egress Door Securing and Releasing Devices.
  9. ANSI/UL 437- Key Locks.
  10. ULC-S328, - Burglary Resistant 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 the Door Hardware Sets at the end of Part 3. 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. 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.
- E. 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. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- 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. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## **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: Reference Division 01, General Requirements. 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. 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 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 at the end of Part 3. 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.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

### **2.2 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. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 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 or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and 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: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  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. Manufacturers:
    - a. Bommer Industries (BO).
    - b. Hager Companies (HA).
    - c. 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. Hager Companies (HA).
  - b. Ives (IV).
  - c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

### **2.3 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. Hager Companies (HA) - ETW-QC (# wires) Option.
    - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
- B. 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. Hager Companies (HA) - Quick Connect.
  - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.

## **2.4 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. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- 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. Hiawatha, Inc. (HI).
  - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
  - c. Trimco (TC).

## **2.5 CYLINDERS AND KEYING**

- A. Cylinders: Original manufacturer cylinders complying with the following:
  1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. 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.
- B. Interchangeable Cores: Provided by Owner.
- C. Key Quantity: Provide the following minimum number of keys:
  1. Construction Keys (where required): Ten (10).
  2. Construction Control Keys (where required): Two (2).
- D. Construction Keying: Provide temporary keyed construction cores.
- E. Key Registration List (Bitting List):
  1. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

## **2.6 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.
    - c. Schlage (SC) – L9000 Series.

## **2.7 AUXILIARY LOCKS**

- A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 certified narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8" diameter bolts.

1. Manufacturers:

- a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.

## **2.8 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.

## **2.9 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. 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.
  6. 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.
  7. 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.
  8. 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.
  9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  12. 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.
    - c. dormakaba Precision (PR) - Apex 2000 Series.

## **2.10 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) – DC6000 Series.
    - b. LCN Closers (LC) – 4040SE Series.
    - c. Norton Door Controls (NO) – 7500 Series.
    - d. Sargent Manufacturing (SA) – 351 Series.

## **2.11 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. Hiawatha, Inc. (HI).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Trimco (TC).

- 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. Sargent Manufacturing (SA).

## **2.12 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. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

## **2.13 ELECTRONIC ACCESSORIES**

- A. 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. Manufacturers:
    - a. Securitron (SU) - AQL Series.

## **2.14 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.

## **2.15 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.
  - 2. Access Control Hardware Devices – conduit rough-in and back box for all new card readers to be provided and installed by Contractor and final wiring and termination of device to be installed by County vendor. Coordinate delivery, rough-in, and installation of devices with Owner.
- 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): Reference Division 01 Sections "Closeout Procedures" and "Cash Allowances". 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.

- B. Manufacturer's Abbreviations:

- 1. MK - McKinney
- 2. PE - Pemko
- 3. RO - Rockwood
- 4. RU - Corbin Russwin
- 5. AD - Adams Rite
- 6. BE - dormakaba Best
- 7. RF - Rixson
- 8. NO - Norton
- 9. SA - SARGENT
- 10. SU - Securitron

**Hardware Sets**

**Set: 1.0**

Doors: D119, D117A, D117B

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	ML2055 PSA CT6SD	626	RU
1 Permanent Core	Provided by Owner	626	
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Closer	7500 / P7500	689	NO
1 Door Stop	400 / 441H	US26D	RO
3 Silencer	608		RO

**Set: 2.0**

Doors: D111

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Surface Vert Rod Exit, Exit Only	ED5470 EO M55	630	RU
1 Surface Vert Rod Exit, Storeroom	ED5470 PR959ET M55 CT6SD	630	RU
2 Door Closer	CLP7500	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
2 Silencer	608		RO

**Set: 3.0**

Doors: D122B, D132

2 Hinge, Full Mortise	TA2714	US26D	MK
1 Hinge, Full Mortise	TA2714 QC	US26D	MK
1 Fail Secure Lock	ML20606 x NAC-SEC PSA CT6SD	626	RU
1 Permanent Core	Provided by Owner	626	BE
1 Door Closer	7500 / P7500	689	NO
1 Door Stop	400 / 441H	US26D	RO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Gasketing	S773BL		PE
1 ElectroLynx Harness - Frame	QC-C1500P		MK
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK
1 Wiring Diagram	WD-SYSPK		SA
1 Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts integrated door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch in lock shunting integrated door position switch and allowing authorized egress at all times. With loss of power or activation of building fire system door remains locked.



**Set: 4.0**

Doors: D135

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Dust Proof Strike	570	US26D	RO
1 Flush Bolt	555	US26D	RO
1 Storeroom Lock	ML2057 PSA CT6SD	626	RU
2 Conc Overhead Stop	1-X36	630	RF
2 Door Closer	7500 / P7500	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Gasketing	S773BL		PE
1 Astragal	S771x6BL		PE

**Set:5.0**

Doors: D108, D109, D110

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Entrance Lock	ML2054 PSA CT6SD	626	RU
1 Permanent Core	Provided by Owner	626	BE
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	400 / 441H	US26D	RO
3 Silencer	608		RO

**Set:6.0**

Door: D147

3 Heavy wt Hinges	T4A3786	US26D	MK
1 Exit Device (rim, storeroom)	ED5200A N959ET	630	RU
1 Door Closer	P7500	689	NO
2 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	as required		RO
3 Silencer		608	RO

END OF SECTION – 087100

## **SECTION 088000 - GLAZING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This project is a Phased construction type project, and as such there shall be work of this Section is included in all Phases of construction to the extent required by contract drawings and or as required to install new work.
- B. This Section includes, but is not limited to, glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Monolithic glass products, including laminated glass.
  - 2. Safety and Security Film installed on glazing.
  - 3. Glazing components and accessories including:
    - a. Elastomeric glazing sealants; glazing tapes; and glazing gaskets.
    - b. Cleaners, primer and sealers; setting blocks; spacers; edge blocks; and perimeter insulation for fire-resistive glazing.
  - 4. Windows
  - 5. Doors
  - 6. Glazed entrances and vision panels
  - 7. Interior vision panels / borrowed lites
  - 8. Storefront Systems
- C. Products Furnished but not Installed Under this Section
  - 1. Glass and glazing products and units installed in following components:
    - a. Windows
    - b. Doors
    - c. Glazed entrances
    - d. Interior vision panels / borrowed lites
    - e. Storefront Systems
- D. Related Sections
  - 1. Division 07 – Joint Sealers
  - 2. Division 08 – Hollow Metal Doors and Frames
  - 3. Division 08 – Door Hardware Schedule

#### **1.2 REFERENCES**

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines"
  - 2. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test;
  - 3. ASTM C 1036 - Standard Specification for Flat Glass;
  - 4. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass;
  - 5. ASTM C 1193 - Standard Guide for Use of Joint Sealants;
  - 6. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings;
  - 7. GANA (GM) - GANA Glazing Manual; Glass Association of North America;

8. GANA (SM) - FGMA Sealant Manual; Glass Association of North America.

### **1.3 DEFINITIONS**

- A. Deterioration of Coated Glass: Defects developed from normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- B. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

### **1.4 PERFORMANCE REQUIREMENTS**

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
- B. Code Requirements for Wind Pressures for Exterior Glazing:
1. Comply with applicable requirements of New Jersey Uniform Building Code including applicable International Building Code – New Jersey Edition, and the following criteria per ASCE 7.
    - a. Adjust wind pressures at corners, edges, and field areas.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. 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.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites ¼ inch thick.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of ¼ thickness unit and for each lite and a nominal 1/2-inch wide interspace.
  4. Center-of-Glass Values: Based on using LBL-35298 WINDOW 5.2 computer program for the following methodologies:
    - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x degree F.
    - b. Solar Heat Gain Coefficient: NFRC 200.
    - c. Solar Optical Properties: NFRC 300.
  5. Fire rated units - Properties based on products of construction indicated.

### **1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 013300 SUBMITTAL PROCEDURES.
- B. Product Data General: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.

1. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
  2. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
  3. Samples
  4. Certificates
- C. Submit manufacturer's specifications, installation instructions, and test data based on specified requirements.
- D. Glazing Schedule: Use same designations indicated on Drawings and specifications.
- E. Pre-construction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.
1. Specified Products: Submit "Product Data", "Samples", "Shop Drawings", and "Quality Control Submittals".
- F. Submit product test data and certificates for all products noted from independent certified testing Lab.
- G. Glazing Materials: Submit manufacturer's specifications and installation instructions for each type of glazing sealant and compound, gasket and associated miscellaneous material required, including manufacturer's published data, or letter of certification, or certified test laboratory report indicating compliance with requirements and indicating product is intended generally for applications shown on Drawings.
- H. Shop Drawings
1. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing schedule listing glass types and thicknesses for each size opening and location.
- I. Samples: Submit two 12 inch x 12 inch samples of each type specified of glass for Architect's review of color, texture and pattern only; compliance with all other requirements is exclusive responsibility of Contractor. Insulating glass samples need to be hermetically sealed, and edge construction must be included in samples: Glass samples include, but are not limited to, the following:
1. Laminated Glass Units
- J. Quality Control Submittals:
1. Certificates: Submit product certificates signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements specified in System Description above and applicable glass type in Part 2 below.
    - a. Elastomeric Glazing Sealants: Submit certifications as specified for elastomeric glazing sealants.
  2. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
    - a. Manufacturer shall have a minimum (5) years documented successful experience with (5) successful projects of similar scope.
    - b. Installer shall have a minimum (5) years documented successful experience with (5) successful projects of similar scope and shall be approved in writing by manufacturer.
- K. Maintenance data.
- L. Warranties: Sample of special warranties.
- M. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
1. Recycled content – documentation showing product supports pre and post - consumer content.
  2. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  3. Comply with recycling program and waste management procedures.

- N. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
1. Requirements of CLOSEOUT PROCEDURES.
  2. Submission of maintenance instructions described in OPERATION AND MAINTENANCE DATA.
  3. Record documents as described in PROJECT RECORD DOCUMENTS.
  4. Demonstration and training requirements indicated in DEMONSTRATION AND TRAINING.

## **1.6 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience and approved by manufacturer.
- C. Labels: Each Individual Piece of Glass: Bear label designating type, thickness and quality. Do not remove labels until reviewed by Architect.
- D. Regulatory Requirements: Comply with the following:
1. Wire Glass: UL approved.
  2. Safety Glass and Glazing: State Statutes, and ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
    - a. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glass Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- E. Qualifications:
1. Manufacturer and fabricator:
    - a. Pre-construction Adhesion and Compatibility testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087.
    - b. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer and/or fabricator using the same type of glass lites and interlayers for each type of unit indicated.
    - c. Source Limitations for Fire Rated Glass: Obtain fire-rated glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
    - d. Source Limitation for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
  2. Installer: Single firm that is approved in writing by glass manufacturer and who is an experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with record of successful in-service performance; and who employs glass installers for this Project who are certified under National Glass Association Glazier Certification Program as Level 2 (Senior Glazier) or Level 3 (Master Glaziers).
    - a. Installer: Single firm experienced in installation of products specified, certified or approved by manufacturer for installation of materials indicated and meeting warranty requirements. Installer to have a minimum of five (5) years of experience in installing commercial scale systems with a minimum of five (5) successfully completed installations over the past three (3) years.
    - b. Installer Experience Listing: Submit list of completed projects using products proposed for the Project, including owner's contact and telephone number for each project, demonstrating compliance with applicable "Qualification" requirements specified in "Quality Assurance".
- F. Pre-construction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape

sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

- G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
- H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1
  - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- I. Mockups: Build mockups as part of exterior wall panel assemblies to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups in location as directed by Architect.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion if approved by Architect.
- J. Glass Identification: Comply with applicable requirements for marking and identification of glass products including (but not limited to) permanent marking of tempered glass and labeling of safety glazing. Comply with applicable requirements of the latest edition of the International Building Code New Jersey Edition and the NJUCC.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage and Protection: protect glazing materials according to manufacturer's written instructions and as need to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

#### **1.8 PROJECT / SITE CONDITIONS**

- A. Field Measurements: Field measure openings before ordering tempered glass products. Contractor is responsible for proper fit of field measured products.
- B. Environmental Requirements: 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.

#### **1.9 WARRANTY**

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Manufacturers Special Warranty on Fire-Rated Units: Written warranty, made out to Owner and signed by fire-rated glass manufacturer agreeing to furnish replacements for fire-rated glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: Five (5) years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 GLASS PRODUCTS, GENERAL**

- A. Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

### **2.2 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with specified requirements, provide products by one of the manufacturers specified.
- B. Refer Division 01 General Requirements for additional information and requirements regarding equivalents or substitutions.

### **2.3 LAMINATED GLAZING PRODUCTS**

- A. Laminated Glazing: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
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. Eastman Chemical Company
    - b. Kuraray America Inc.
    - c. Or approved equal
  2. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
  3. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  4. Interlayer Color: Clear unless otherwise indicated.

### **2.4 SECURITY ACCESSORIES**

- A. Safety and Security Film
1. Provide safety and security film on new or existing glazing panels as indicated on drawings.
  2. Manufacturer: Suntek Window Films, Martinsville, VA 24112; 267-632-4991; [www.suntekfilms.com](http://www.suntekfilms.com); or approved equal.
  3. Product:
    - a. Provide 8mm clear safety and security window film.
    - b. Designed for safety and security applications.
    - c. Crystal clear appearance.
    - d. Advanced adhesion formulation.

- e. Superior optical clarity.
- f. Blocks over 99% of the sun's damaging ultraviolet rays, keeping upholstery, carpet and window treatments looking like new.
- g. Manufacturer's Warranty.

4. **PRODUCT SPECIFICATIONS**

- a. Visible Light Transmittance 83%
- b. Total Solar Transmittance 77%
- c. Total Solar Reflectance 8%
- d. Total Solar Absorbance 15%
- e. Visible Light Reflectance 10%
- f. Winter U-Value 1.05
- g. UV Rejected 99%
- h. Shading Coefficient 0.92
- i. Total Solar Energy Rejected 19%

5. **PHYSICAL PROPERTIES**

- a. Film Thickness 0.008"
- b. Single or Multi-Ply: Multi
- c. Tensile Strength 32,500 psi
- d. Break Strength 269 lbs/inch
- e. Elongation at Break >100%
- f. Peel Strength 2750 g/inch
- g. Puncture Strength 173 lbs

6. **Testing:**

- a. Small Missile Impact Test – ANSI Z-97.1 and CPSC 16 CFR 1201
- b. Large Missile Impact & Cyclic Wind Pressure Tests – ASTM E 1886-02/ASTM E 1996-03, Level C, 4.5 lb 2"x 4"
- c. GSA Explosive Test – GSA-TS01-2003
- d. Flame Spread and Smoke Developed Test – ASTM E-84

**2.5 GLAZING GASKETS**

- A. **Dense Compression Gaskets:** Verify compatibility of gaskets with other materials in glazing system including glass seal. Provide molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
  - 1. Neoprene, ASTM C 864
  - 2. EPDM, ASTM C 864
  - 3. Silicone, ASTM C 1115
  - 4. Thermoplastic polyolefin rubber, ASTM C 1115
  - 5. Any material indicated above of hardness and profile to maintain watertight seal.
  
- B. **Soft Compression Gaskets:** Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
  - 1. Neoprene
  - 2. EPDM
  - 3. Silicone
  - 4. Thermoplastic polyolefin rubber
  - 5. Any material indicated above of hardness and profile to maintain watertight seal.



- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C542, black.

## **2.6 GLAZING SEALANTS**

- A. General: Provide products of type indicated, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will 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 selected by Architect from manufacturer's full range of standard and premium characteristics.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Additional Movement Capability: Where additional movement capability is required. Provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated. Refer to joint sealant specification Division 7.
- D. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

## **2.7 MISCELLANEOUS GLAZING MATERIALS**

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. 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.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

## **2.8 FABRICATION OF GLAZING UNITS**

- A. Fabricate glazing units in sizes required to glaze 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.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic sites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

- C. Grind smooth and polish exposed glass edges.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which glass and glazing products are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
  - 1. Require glazing installer to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazing installer's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.
  - 2. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.
  - 3. Verify that openings for glazing are correctly sized and within tolerance.
  - 4. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Prime Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
  - 1. Examine framing receiving glazing, with framing Installer present, for compliance with following:
    - a. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
    - b. Presence and functioning of weep system.
    - c. Minimum required face or edge clearances.
    - d. Effective sealing between joints of glass-framing members.

#### **3.2 PREPARATION**

- A. Cleaning and wash down of Masonry and walls: Complete cleaning prior to glass installation.
- B. Clean contact surfaces with solvent and wipe dry.
  - 1. Surface Preparation: Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- D. Prime surfaces scheduled to receive sealant.
- E. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

#### **3.3 GLAZING**

- A. General: 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.

1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
  2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
  3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
  4. 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.
  5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
  6. Provide spacers for glass lites where length plus width is larger than 50 inches.
  7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
  8. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
  9. 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.
  10. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gaskets manufacturer to prevent corners from pulling away: seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- B. Gasket Glazing (Dry) at interior locations: Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. 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.
  2. 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 weather-tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
  3. Install gaskets so they protrude past face of glazing stops.
- C. Sealant Glazing (Wet): 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.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
  2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.
- D. Lock-Strip Gasket Glazing: Comply with ASTM C 716 and gasket manufacturers written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

### **3.4 ADJUSTING / CLEANING**

- A. Examine glass surfaces adjacent to or below concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline despoite, or stains: remove as recommended by glass manufacturer.

- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damage in any way, including natural causes, accidents, and vandalism, during construction period.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.
  - 1. Remove labels after work is complete.
- D. Remove labels and visible markings.
- E. Comply with waste management and recycling program requirements.
- F. Dispose of all waste legally and in compliance with local jurisdiction requirements.

### **3.5 PROTECTION**

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

### **3.6 PROTECTION OF FINISHED WORK**

- A. Protection: Completely cover glass during spray painting, texturing or other construction operations that might cause damage to glass.
- B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

END OF SECTION

## **SECTION 090600 - CONCRETE FLOOR PREPARATION FOR FINISHES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Preparing new and existing concrete floor surfaces for application of new finishes.

#### **1.2 PREINSTALLATION MEETINGS**

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review conditions affecting substrate preparation.
  - 2. Review procedures that will be used for substrate preparation.
  - 3. Require attendance by finish flooring installers to review preparation requirements of floor finish product and flooring adhesive manufacturers.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of shot blasting equipment used on the project.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer performing surface preparation.
- B. Field quality-control reports.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained in the use of the equipment and techniques required to produce the specified results.
- B. Mockups: Provide field mockups to set quality standards for surface preparation execution and for preconstruction testing.
  - 1. Provide mockup of typical surface preparation, minimum 100 sq. ft. in size. Coordinate required size with requirements for preconstruction testing.
  - 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.

#### **1.6 PRECONSTRUCTION TESTING**

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform

preconstruction testing on field mockups to verify adhesion of floor finishes specified in other sections to prepare concrete substrate.

1. Apply minimum 25 sq. ft. primer specified in Division 9 Section "High Performance Coatings" to mockup. Conduct paint manufacturer's recommended adhesion test at minimum two locations within mockup to ensure adequate bond with substrate is achieved.
2. Apply minimum 25 sq. ft. finish paint in number of coats specified in Division 9 Section "High Performance Coatings" to mockup. Conduct paint manufacturer's recommended adhesion test at minimum two locations within mockup to ensure adequate bond with substrate is achieved.
3. Coordinate supply of floor finish materials required to conduct preconstruction adhesion tests.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

- A. Shot Blasting Equipment: Automatic, dry shot blast type, self-contained capable of recycling shot and to collecting surface abrasions.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify new concrete floors have cured minimum 28 days.
- B. Examine substrates, with Installer present, for compliance with requirements for surface contamination, damage, and other conditions affecting performance of the Work.
- C. Examine substrate to determine repairs required to restore substrate surface to be within tolerances required for floor finishes specified in other sections, prior to completing Work of this section.
- D. Examine substrate to verify surfaces prepared in accordance with this section will be suitable for application of finishes specified in other sections.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance with recommendations for methods and materials required to correct conditions before proceeding with work of this section.
- F. Proceed with surface preparation only after unsatisfactory conditions have been corrected.

### **3.2 SURFACE PREPARATION**

- A. Mechanically clean concrete substrate and create surface profile in existing concrete substrate in accordance with ASTM D 4259.
  1. Shot blast concrete substrate to remove surface and penetrating contaminants to

produce a surface profile of CSP 3 in accordance with ICRI Technical Bulletin No. 03732.

2. Acceptable substrate surfaces will be free of laitance, oil, grease, flooring adhesive, paint, and other surface contaminants capable of affecting bond of specified floor finishes with concrete substrate.
- B. Repair surface irregularities after cleaning.
1. Fill bug holes, spalls, cracks, deteriorated joints and other surface damage exposed or created as a result of substrate cleaning operations flush with adjacent surfaces to provide sound substrate for specified floor finish.
- C. Dry clean concrete substrates immediately before application of specified floor finishes in accordance with ASTM D 4258 using broom or vacuum cleaning methods to remove loose materials on substrate surface.

### **3.3 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Visual inspection of completed substrate preparation to verify contamination is removed.
  2. Visual inspection of completed substrate preparation to verify surface profile matches ICRI CSP 3, using standard mold for visual comparison.

### **3.4 PROTECTION**

- A. Protect prepared concrete substrates from contamination. Re-clean substrates that are contaminated by construction operations prior to installation of specified floor finishes.

END OF SECTION - 090600

## **SECTION 090650 - CONCRETE FLOOR MOISTURE CONTENT AND pH TESTING**

### **PART 1- GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Concrete moisture content testing using water vapor emission method.
  - 2. Concrete moisture content testing using relative humidity method.
  - 3. Concrete pH testing.

#### **1.2 PERFORMANCE REQUIREMENTS**

- A. Maximum Moisture Content: 3.0 lbs/1000 sf/24 hours for slabs-on-grade receiving floor coverings.
- B. Maximum Relative Humidity: 75 percent for slabs-on-grade receiving floor coverings.
- C. Maximum pH: 8.5 for floor slabs receiving floor coverings.

#### **1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. Indicate test locations shown on building floor plan,
- B. Product Data:
  - 1. Submit model and manufacturer for calcium chloride test kits.
  - 2. Submit data indicating model, manufacturer, and calibration record for relative humidity measuring equipment.
  - 3. Submit data for floor slab treatment products.
- C. Test Reports: Report test results in chart form.
  - 1. Calcium Chloride Test Method: Indicate test dates, start/stop time, start/stop weight, weight gain in grams, water vapor emission rate, and pH levels.
  - 2. Relative Humidity Test Method: Indicate test dates, time, depth of test well, test well temperature, relative humidity and pH levels.
  - 3. Submit record of ambient air temperature, ambient relative humidity, and floor slab surface temperature when test sites are prepared, start of test, and end of test.
  - 4. Indicate condition of building enclosure including position of operable windows and exterior doors when test sites are prepared, start of test, and end of test.
  - 5. Submit transcript of data logger.
  - 6. Indicate operational status of HVAC systems maintaining environmental condition of spaces where tests are conducted when test sites are prepared, start of test, and end of test.



#### **1.4 QUALIFICATIONS**

- A. Testing Agency Qualifications: An independent agency qualified for testing indicated.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver calcium chloride test kits to Project site in manufacturer's original, sealed packaging.
- B. Accept test kits on site. Inspect test kits for damage. Replace damaged test kits.

#### **1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Do not perform concrete moisture testing until building is enclosed and HVAC system is operational.
- B. Maintain building test areas at design operating conditions for minimum 48 hours before, during, and continuously after conducting testing.

#### **1.7 SCHEDULING**

- A. Schedule work to permit concrete moisture testing to be completed minimum one week and maximum 3 weeks before floor coverings are installed.

### **PART 2 - PRODUCTS**

#### **2.1 CALCIUM CHLORIDE TEST KITS**

- A. Calcium Chloride Test Kit: Comply with ASTM F1869.

#### **2.2 RELATIVE HUMIDITY TEST EQUIPMENT**

- A. Humidity and Temperature Probe and Meter: Comply with ASTM F2170.

#### **2.3 pH TEST MATERIALS**

- A. pH Test Paper: Capable of indicating minimum 7.0 to 13 pH range.
  - 1. Micro Essential Laboratory.
- B. pH Color Gage: Furnish pH test paper manufacturer's visual color gage to identify measured pH.
- C. Water: Distilled or de-ionized.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify new concrete floors have cured minimum 28 days.

### **3.2 PREPARATION**

- A. When building HVAC system is not operational and maintaining test areas at design operational conditions, install recording hygrometer or data logger in each separate test area to record ambient temperature and relative humidity beginning 48 hours before start of tests until completion of tests within each area.
- B. Select three moisture test sites for first 1,000 sf and one moisture test site for each additional 1,000 sf of floor area receiving floor finishes.
  - 1. Layout test site locations uniformly distributed throughout each test area.
- C. Mechanically clean each test site to remove oils, laitance, curing compounds, adhesives, and other contaminants affecting water vapor emissions as specified in Section 090600.
  - 1. Remove cleaning residue.
  - 2. Do not apply water or other liquid to floor slabs and test sites.

### **3.3 CONCRETE MOISTURE TESTING – GENERAL**

- A. Conduct calcium chloride test and relative humidity test at each test site.
- B. Conduct one pH test at each test site.

### **3.4 CALCIUM CHLORIDE TESTING**

- A. Perform tests in accordance with ASTM F1869.

### **3.5 RELATIVE HUMIDITY TESTING**

- A. Perform tests in accordance with ASTM F2170.
- B. Conduct relative humidity testing at the following depths:
  - 1. Slabs-On-Grade: Measure temperature and relative humidity at 40 percent of slab thickness measured from top surface.
- C. Drill test hole at each test site to accommodate test sleeve.
  - 1. Hole Diameter: In accordance with test equipment manufacturer's instructions.
  - 2. Drilling Fluids: Not permitted.
- D. Vacuum dust and debris from test hole.
- E. Insert sleeve, to the full depth of test hole. Cap or plug sleeve to prevent test hole contamination.
- F. Permit the test site to acclimate for minimum 72 hours before measuring relative humidity.
- G. Remove sleeve plug and insert probe to bottom of test hole. Allow test probe to reach

temperature equilibration with concrete slab.

- H. Measure and record temperature and relative humidity at the test site.

### **3.6 pH TESTING**

- A. Place several drops of water onto the concrete surface to form a puddle approximately 1 inch in diameter.
- B. Allow the water to set for approximately 60 seconds
- C. After 60 seconds, dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
- D. Record and report results.

### **3.7 ACCEPTANCE CRITERIA**

- A. Concrete floor slabs will be considered acceptable for installation of floor finishes when floors conform to performance criteria specified in this section.
- B. When concrete floors do not meet specified performance criteria, obtain recommendations from floor finish manufacturers for remediation measures necessary to permit successful floor finish installation.

END OF SECTION - 090650

## **SECTION 092116 - GYPSUM BOARD ASSEMBLIES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes but is not limited to the following:
  - 1. Performance criteria for gypsum board assemblies.
  - 2. Metal stud wall framing.
  - 3. Metal channel ceiling framing.
  - 4. Cementitious backing board.
  - 5. Gypsum wallboard.
  - 6. Joint treatment and accessories.

#### **1.2 RELATED REQUIREMENTS**

- A. Division 01 – Specifications
- B. Division 05 – Metal Fabrications
- C. Division 06 – Rough Carpentry
- D. Division 07 – Joint Sealants
- E. Division 08 – Access Doors and Frames
- F. Division 09 – Tiling (Tile)
- G. Division 09 – Painting

#### **1.3 REFERENCE STANDARDS**

- A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.
- D. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- E. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2007.
- F. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
- G. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2007.
- H. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2007.
- I. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness; 2007.
- J. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- K. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2005.
- L. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing; 2007.
- M. ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets; 2004.
- N. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2006a.
- O. ASTM C 1629/C 1629 - Standard Classification for Abuse-Resistant Non-decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2006.

- P. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000 (Reapproved 2005).
- Q. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2005.
- R. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.
- S. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2006.
- T. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.
- U. USGBC LEED - NC - LEED Green Building Rating System for New Construction.

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 013300 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
  - 2. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
- D. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
  - 1. Indicating percentages by weight of post-consumer and pre-consumer recycled content for each product having recycled content.
  - 2. Include statement indicating cost for each product having recycled content.
  - 3. For steel products indicate steel mill process.
  - 4. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  - 5. Proposed products are manufactured within a 500 - mile radius of the project site and are considered to be a locally produced material which supports regional materials and resources.
  - 6. Comply with recycling program and waste management procedures.
  - 7. Comply with optimizing energy performance.
- E. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
  - 1. Requirements of CLOSEOUT PROCEDURES;
  - 2. Submission of maintenance instructions described in OPERATION AND MAINTENANCE DATA;
  - 3. Record documents as described in PROJECT RECORD DOCUMENTS;
  - 4. Demonstration and training requirements indicated in DEMONSTRATION AND TRAINING.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum ten (10) years of documented experience.
- B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

- D. Sound Transmission Characteristics: For gypsum board assemblies provide materials and construction identical to those tested in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency. Fulfill STC rating levels where indicated on drawings.
- E. Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate quality of workmanship and aesthetic effects of materials and execution.
  - 1. Install mockups for the following applications. In-place texture finishes often vary from manufacturers' samples. Requiring a mockup is recommended.
    - a. Surfaces indicated to receive non-textured paint finishes.
  - 2. Simulate finished lighting conditions for review of mockups.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
  - 1. Do not install gypsum board when ambient temperature is below 40 degrees F.
  - 2. For adhesive attachment of gypsum board at window / door jamb locations, and for finishing of gypsum board, maintain ambient temperature above 55 degrees F from one week prior to attachment or joint treatment is complete and dry.

## PART 2 - PRODUCTS

### 2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C 840 and GA-216.
  - 1. See PART 3 for finishing requirements.
- B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
  - 1. Fire Rated Assembly: see contract drawings for fire rated assemblies; with 1-hour rating.
  - 2. UL Assembly Numbers: Provide construction equivalent to that listed for the assembly in the current UL Fire Resistance Directory.
- C. Single Source Responsibility: For all gypsum board throughout Project, provide gypsum board and related materials, including accessories, fasteners and finishing materials provided by same manufacturer.

### 2.2 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories, basis of design, Marino\Ware: [www.marinoware.com](http://www.marinoware.com) or approved equal.
- B. Other acceptable manufacturers may include the following after a compliance review:
  - 1. Clark Western Building Systems: [www.clarkwestern.com](http://www.clarkwestern.com).
  - 2. Dietrich Metal Framing: [www.dietrichindustries.com](http://www.dietrichindustries.com).
  - 3. Or approved equal
- C. Non-Load bearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 10 psf.
  - 1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud

- heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
2. Studs: "C" shaped with flat or formed webs with knurled faces.
  3. Runners: U shaped, sized to match studs.
  4. Ceiling Channels: C shaped.
  5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
  6. Framing Members and minimum properties:
    - a. Cold Rolled Channels: 16 Gage bare steel thickness, with minimum 1/2-inch- wide flange, 3/4 inch deep.
    - b. Steel Studs: ASTM C 645, in depth indicated.
      - 1) Minimum Base Metal Thickness: 20 Gage minimum.
    - c. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep or 1 1/2" as indicated.
      - 1) Minimum Base Metal Thickness: 20 Gage minimum.
- D. Partition Framing:
1. Steel Studs and Runners: ASTM C 645, in depth indicated.
    - a. Minimum Base Metal Thickness: 20 Gage minimum.
  2. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.
  3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
    - a. Products:
      - 1) Marino Ware Products or approved equal.
  4. Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Products:
      - 1) Marino Ware Products or approved equal.
  5. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
    - a. Minimum Base Metal Thickness: 20 Gage minimum.
  6. Cold-Rolled Channel Bridging: 18 Gage bare steel thickness, with minimum 1/2-inch- wide flange, and in depth indicated.
    - a. Clip Angle: 16 Gage thick, galvanized steel.
  7. Hat-Shaped, Rigid Furring Channels: ASTM C 645, in depth indicated.
    - a. Minimum Base Metal Thickness: 22 Gage minimum.
  8. Cold-Rolled Furring Channels: 18 Gage bare steel thickness, with minimum 1/2-inch- wide flange, and in depth indicated.
    - a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness 22 Gage minimum.
    - b. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 16 Gage diameter wire, or double strand 20 Gage diameter wire.
  9. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

- E. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.
  - 1. Suspended Ceiling:
    - a. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 16 Gage diameter wire, or double strand 20 Gage diameter wire.
    - b. Hanger Attachments to Concrete:
      - 1) Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.
        - a) Type Post-installed, expansion anchor.
      - 2) Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
  - 2. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 8-gage diameter.
- F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
  - 1. Material: ASTM A 653/A 653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
- G. Recycled content to be a minimum of 25% post-consumer content per LEED requirements.

### 2.3 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
  - 1. USG Corporation
  - 2. Georgia Pacific
  - 3. CertainTeed Corporation
  - 4. National Gypsum Corporation
  - 5. Or approved equal
- B. Ceiling Board (Use at interior ceilings and soffits.): Special sag-resistant gypsum ceiling board as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.
  - 1. Application: Ceilings, unless otherwise indicated.
  - 2. Thickness: (1) layers of 5/8" inch type 'X'
  - 3. Edges: Tapered.
  - 4. Products:
    - a. USG; Sheetrock® Brand Ultralight panels Firecode® X.
    - b. Georgia Pacific
    - c. CertainTeed Corporation; ProRoc Interior Ceiling
    - d. Or approved equal
- C. Hi-Impact Gypsum Wallboard (Use at all interior partitions from finished floor to a minimum of 6" above the ceiling line.): ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered. Fiberglass mesh embedded in core for improved impact resistance.
  - 1. Products / Location: Required at ALL vertical wall locations.
    - a. Mold Tough VHI – Abuse Resistant/ Impact Resistant by USG, 5/8" Thickness. Type "X"



- b. or approved equal.
- D. Mold Resistant Wallboard (Use at all interior partitions and ceiling locations in bathrooms, and locker rooms.): Green and brown paper-faced 5/8" thick Type "X" gypsum wallboard as defined in ASTM C 1396M / C630; sizes to minimize joints in place; ends square cut.
  - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM C 473.
    - a. Mold-resistant board is required at all locations.
- E. Tile Backer Board for dry or high-humidity interior areas such as toilet rooms, locker rooms, and single occupancy toilets in accordance with IBC, NJ Edition):
  - 1. Fiber Reinforced – Water Resistant Gypsum Backing Board: ASTM C 1278, with Fire Rated Core.
    - a. Product: Fiberock Interior Panels, "Aqua – Tough" by USG: 5/8" Thickness minimum, Fire Rated Type "X" or approved equal.
- F. Sustainability Requirements:
  - 1. Provide gypsum products using a minimum 5% post-consumer and 95% pre-consumer recycled content.

## 2.4 ACCESSORIES

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
  - 1. Types: As detailed or required for finished appearance.
- C. Metal Trim for Gypsum Board – Interior Applications: Galvanized steel, 26 Gage minimum; conforming to profile and dimensions indicated on Drawings.
  - 1. Dry Locations:
    - a. Corner Beads: All-metal galvanized steel reinforcement; similar to "Dur-A-Bead" by USG with spackle edge or approved equal.
    - b. Edge Beads: Steel trim shapes with feathered edge suitable for finishing with joint compound recommended by trim manufacturer, similar to "Sheetrock L-Trim and J-Trim" and "Sheetrock Expanded Flange Corner bead" by USG or approved equal, "Sheetrock J-Stop" not acceptable.
    - c. Control Joints: Roll-formed zinc with perforated flanges, 1-3/4 inch wide, with 1/4 inch wide center channel and provided with removable tape strip over channel; similar to "Sheetrock Zinc Control Joint No. 093" by USG with spackle feathered edge or approved equal.
  - 2. Wet Locations:
    - a. Vinyl accessories trim accessories for interior gypsum board at wet and humid applications may be considered for corner beads, edge beads, and control joints. Architect to review and approve thru the submittal process.
- D. Trim for Exterior Soffits: Rolled zinc complying with ASTM C1047.
- E. Special Trim and Reveals: Extruded aluminum alloy 6063-T5, profiles as indicate.
- F. Backer Plates: Galvanized steel; 6 inches wide x 16 gage minimum x lengths to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories. Elimination of backer plates or direct attachment of accessories or equipment to studs not acceptable.
- G. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges. All accessories to have feathered edges to receive spackle.

- H. Manufacturers - Finishing Accessories:
  - 1. Same manufacturer as framing materials.
  
- I. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions and in accordance with sustainability requirements in Division 01.
  
- J. Joint Tape: requirements.
  - 1. Interior Gypsum Wallboard: Mold resistant tape as recommended by panel manufacturer.
  - 2. Exterior Gypsum Soffit Board: Mold Resistant tape as recommended by panel manufacturer.
  - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh and high impact reinforcement mesh and tape as recommended by the panel manufacturer.
  - 4. Tile Backing Panels: Glass Fiber Mesh tape, Alkali and Mold resistant as recommended by panel manufacturer.
  
- K. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Pre-filling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use drying-type, all-purpose compound.
    - a. Use drying type joint compound, similar to USG Sheetrock brand All-Purpose Joint Compound for installing tape and metal trim accessories or approved equal.
    - b. Interior Gypsum Wallboard: Utilize mold resistant type joint compound as recommended by panel manufacturer.
    - c. Exterior Gypsum Soffit Board: Utilize mold resistant type compound as recommended by panel manufacturer.
    - d. Glass-Mat Gypsum Sheathing Board: Utilize mold resistant type as recommended by the panel manufacturer.
    - e. Tile Backing Panels: Utilize mold resistant type as recommended by panel manufacturer.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
  
- L. Adhesives and Joint Treatment Materials: Conform to requirements of ASTM C475.
  - 1. Joint Compounds:
    - a. Interior Gypsum Board Applications – Provide one of the following types:
      - 1) Single component compound for both bedding and finishing joints; similar to “Sheetrock All-purpose Joint Compound” by USG.
      - 2) Two-component compound (one compound for bedding and another compound for finishing joints); similar to “Sheetrock Taping Joint Compound and Topping Joint Compound” by USG or approved equal.
  
- M. Joint Compound for Exterior Sheathing Applications:
  - 1. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.
  
- N. Joint Compound for Tile Backing Panels Applications:
  - 1. Water-Resistant / Mold Resistant Fiber Reinforced Gypsum Backing Board: As recommended by manufacturer.
  
- O. Joint Compound for Fiber Rock Panels – VHI Abuse Resistant:
  - 1. Fiber Rock Panels - VHI Abuse Resistant: embed joint tape in Setting Type Joint compound “Durabond” as recommended by manufacturer or approved equal.

- P. Joint Compound for Fiber Rock Aqua-Tough Interior Panels:
  - 1. Painted Applications - Fiber Rock Aqua-Tough Interior Panels: embed joint tape in Setting Type Joint compound "Durabond" as recommended by manufacturer or approved equal.
  
- Q. Joint Treatment for Cementitious Tile Backer Board:
  - 1. Durock Brand Cement Board by USG: embed Durock™ brand interior tape (or equal) in cementitious setting mortar recommended by manufacturer meeting ANSI Specification 118.4 or 118.1 or approved equal.
  
- R. Reinforcing Joint Tape: Mold resistant tape complying with ASTM C475, 2-inch nominal width; similar to "Sheetrock Joint Tape" by USG or approved equal.
  - 1. Backer Board: Provide fiberglass tape as recommended by board manufacturer and acceptable to manufacturer of ceramic tile setting materials; similar to "Durock Brand Tape" by USG or approved equal.
  
- S. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.
- T. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C 954; steel drill screws for application of gypsum board to load bearing steel studs.
- U. Backer Board Accessories: Provide accessories and corrosion-resistant steel screws as recommended by backer board manufacturer and required for complete installation.
- V. Sound Attenuation Blankets: ASTM C 665, 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 and ASTM-E84.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractors in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Verify that project conditions are appropriate for work of this section to commence.

### **3.2 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C 754 and manufacturer's instructions.
  - 1. Tolerances:
    - a. Do not exceed 1/8 inch in 8 feet variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
    - b. Do not exceed 1/16-inch variation between planes of abutting edges or ends.
    - c. Shim as required complying with specified tolerances.

2. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings or similar construction.
  3. Comply with applicable requirements and recommendations in Gypsum Association 216, "Recommended Specifications for the Application and Finishing of Gypsum Board" for installation of gypsum board, except for more stringent requirements of manufacturer.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.
  2. Laterally brace entire suspension system. Refer to cross wire detail on drawings.
- C. Studs: Space studs as permitted by standard.
1. Extend partition framing to structure (roof deck or floor slab/deck) see partition types.
  2. Where studs are installed directly against exterior walls, install isolation strip between studs and wall.
  3. Extend partition framing full height to roof deck supports or floor slab/deck above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  4. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
    - a. Height of Partitions: Extend top of all partitions to bottom of structural floor or roof deck above unless otherwise indicated. Provide compressible filler at top joint to isolate deflection and seal joint. In all cases, maintain fire rating and sound isolation rating between adjacent spaces for entire height of partition from floor to structural floor or roof deck above. If partition is constructed under and parallel to steel, concrete or laminated wood structural framing apply following:
    - b. Solid Beams and Girders: Extend partition to bottom of structural beams and girders. Provide compressible filler at top joint to isolate deflection and seal joint.
    - c. Open Web Joists, Beams or Girders: Extend partition to bottom of joist, beam or girder. Fill depth of joist, beam or girder (between top of masonry and floor or roof deck above) with masonry or other material acceptable to Architect. Provide compressible filler at top joint to isolate deflection and seal joint.
    - d. Floor and Ceiling Runner Tracks: Align runner tracks to partition layout at both floor and ceiling. Secure runner tracks as recommended by stud manufacturer for floor and ceiling construction involved, except do not exceed 24 inches o. c. spacing for nail or power-driven fasteners, nor 16 inches o. c. for other types of attachment. Provide fasteners at all corners and ends of runner tracks.
  5. Provide cross bracing framing at 48" o.c. maximum.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation: Vertically unless otherwise noted on drawings.
  2. Spacing: As indicated.
- F. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.
- G. Blocking: Install fire treated wood blocking for support of:

1. Framed openings.
2. Wall mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall mounted door hardware.

### **3.3 BOARD INSTALLATION**

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
1. Space screws a maximum of 12 inches o.c. for vertical applications.
  2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
  3. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
  4. On partitions/walls, apply gypsum panels horizontally or perpendicular 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 board.
    - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
  5. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
  6. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
  7. Laminating to Substrate: Comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- B. Tile Backing Panels:
1. Water-Resistant / Mold Resistant Fiber Reinforced Gypsum Backing Board: Install with 1/4-inch gap where panels abut other construction or penetrations.
  2. Glass-Mat, Water-Resistant Backing Panel: Install with 1/4-inch gap where panels abut other construction or penetrations.
  3. Cementitious Backer Unit Application: ANSI A108.11.
  4. Complete plumbing rough-in before boards are erected. Separate board from rough-in and fixtures and fill space as recommended by manufacturer. Securely fasten boards to substrate as required. Follow manufacturer's instructions for treatment of edge terminations. At joints and corners, embed fiberglass tape in skim coat of mortar or tile setting adhesive.
- C. Water-Resistant Gypsum Board: Complete plumbing rough-in before gypsum board panels are erected. Separate gypsum panels from rough-in and fixtures by 1/4-inch space. Install water-resistant board horizontally. Do not place water-resistant board directly over vapor retarder.
1. Make necessary cut-outs and seal cut or exposed panel edges with thinned-down ceramic tile adhesive or with waterproof flexible sealant, as recommended by gypsum board manufacturer.
  2. Prior to tile application, fill openings around pipes, fittings, fixtures, interior angles and other penetrations with waterproof flexible sealant, as recommended by gypsum board manufacturer. Do not fill 1/4-inch gap at bottom of panels.
- D. High-Impact Gypsum Panels: Install in accordance with manufacturer's recommendations for applications shown on Drawings, including cutting panels.
1. Position all ends and edges of panels over framing members where possible.
  2. Apply panels to ceilings first (where applicable) and then to walls. Extend ceiling boards into corners, making firm contact with top plate. Minimize end joints and fit ends and edges closely

- but not forced. Stagger end joints in successive courses with joints on opposite sides of partition on different studs.
3. Attach panels to framing supports as recommended by gypsum board manufacturer for applications shown on Drawings, spacing fasteners as recommended by manufacturer but not less than 3/8 inches from edges and ends of panels.
- E. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- F. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- G. Soffits: Apply gypsum panels perpendicular to supports, with end joints staggered and located over supports.
1. Fasten with corrosion-resistant screws at spacing required by manufacturer.

### **3.5 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
1. Trim: Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer. Install in single un-jointed lengths unless run exceeds longest available stock length. Miter corners of semi-finishing type trim. Coordinate installation of trim continuously with gypsum board installation.
    - a. Install metal corner beads at external corners. Securely fasten metal corner beads as recommended by manufacturer. Do not use fasteners that cannot be fully concealed by joint compound fill applied over flanges.
    - b. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.
    - c. Edge Trimming: Provide specified type of metal casing bead trim.
  2. Control Joints: Form control joints in gypsum board construction where shown on Drawings. Allow 1/2-inch continuous opening between edges of adjacent boards to allow for insertion of control joint trim accessory. Insert control joint strips into open joint and attach flanges to gypsum board in accordance with manufacturer's instructions.
    - a. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
    - b. Install control joints within long runs of partitions, ceilings or soffits at approximately 30 feet on center or as indicated.
    - c. Where gypsum board is vertically continuous, provide horizontal control joints at each floor level transition.
  3. Joint and Corner Reinforcing: Use joint tape to reinforce joints formed by tapered edges or butt ends of drywall units and at interior corners or angles. Set tape in joint compound then apply skim coat over tape in one application.
    - a. Where open spaces of more than 1/16-inch width occur between abutting drywall units, except at control joints, pre-fill joints with joint compound and allow pre-fill to dry before application of joint tape.
  4. Special Trim: Install as indicated on Drawings and in accordance with manufacturer's instructions.

### **3.6 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C 840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- C. Finishing Gypsum Board Panels: 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.
1. Pre-fill open joints, beveled edges, and damaged surface areas.
  2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
  3. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- D. Tile / Cementitious Backer Units: Finish according to manufacturer's written instructions.

### **3.7 ADJUSTING / CLEANING**

- E. Repair, replace, and correct damage and defects that may telegraph through finish installation. Leave installation smooth and uniform.
- F. Dispose of waste legally and in accordance with local jurisdiction requirements.
- G. Comply with waste management and recycling program requirements.

END OF SECTION - 092116

## **SECTION 093000 – TILING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes, but is not limited to the following:
  - 1. Tile for floor applications.
  - 2. Tile for wall applications.
  - 3. Cementitious backer board as tile substrate.
  - 4. Stone thresholds.
  - 5. Ceramic accessories.
  - 6. Ceramic trim.

#### **1.2 RELATED REQUIREMENTS**

- A. Division 01 – Specifications
- B. Division 03 – Concrete
- C. Division 07 – Joint Sealants
- D. Division 08 – Access Doors and Frames
- E. Division 09 – Gypsum Board
- F. Division 09 – Concrete Preparation

#### **1.3 REFERENCE STANDARDS**

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); current edition.
  - 7. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; current edition.
  - 8. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; current edition.
  - 9. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; current edition.
  - 10. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; current edition.
  - 11. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; current edition.
  - 12. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; current edition.
  - 13. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; current edition.
  - 14. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; current edition.
  - 15. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; current edition.
  - 16. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; current edition.
  - 17. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; current edition.



18. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; current edition.
19. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; current edition.
20. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; current edition.
21. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; current edition.
22. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; current edition.

B. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America, Inc.; current edition.

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 #013300 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  1. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junction and intersections with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches illustrating pattern, color variations, and grout joint size variations.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes in accordance with sustainable and VOC requirements.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
- G. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
  1. Sustainability / Environmental Submittals: Show evidence including, but not limited to the following:
  2. Recycled content – documentation showing product supports pre and post - consumer content.
  3. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  4. Proposed products are manufactured within a 500-mile radius of the project site and considered to be a locally produced material which supports regional materials and resources.
  5. Comply with recycling program and waste management procedures.
  6. Comply with optimizing energy performance.
- H. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
  1. Requirements of Division 01 CLOSEOUT PROCEDURES;
  2. Submission of maintenance instructions described in Division 01 OPERATION AND MAINTENANCE DATA;
  3. Record documents as described in Division 01 PROJECT RECORD DOCUMENTS;
  4. Demonstration and training requirements indicated in Division 01 DEMONSTRATION AND TRAINING.

### **1.5 QUALITY ASSURANCE**

- A. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate quality of workmanship.
  - 1. Build mockup of each type of floor tile installation.
  - 2. Build mockup of each type of wall tile installation.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion and approved in advance by Architect.
- B. Manufacturer: Provide manufacturer's representative for consultation at Project Site with ceramic tile installer during ceramic tile installation as requested by Architect, Construction Manager or General Contractor.
- C. Installer: Minimum of least (8) years of experience in installation of ceramic tile applications similar to those indicated in this Project, and at least 5 successfully completed ceramic tile installations of similar scope, complexity and materials completed within (3) years prior to award of Contract.
  - 1. Provide thoroughly trained and experienced journeymen tile setters who are completely familiar with specified requirements and with recommendations in standards referenced in this Section.
  - 2. Contractor is advised that allowance will not be made in inspection of installed tile for lack of skill of tile setters.
- D. Maintain one copy of TCA Handbook and ANSI A108 Series/A118 Series on site.
- E. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 10 years of documented experience.
- F. Installer Qualifications: Company specializing in performing tile installation, with minimum of 8 years of documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver materials and store on site in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's directions.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

### **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. 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. Provide full size units, matching installed materials; packaged and marked for identification. Obtain receipt and submit copy of receipt to Architect

### **1.8 FIELD CONDITIONS**

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F follow manufacturer's instructions during installation of mortar materials. Follow all sustainable requirements from specification section 01.

## **PART 2 - PRODUCTS**

### **2.1 TILE**

- A. Available Manufacturers:
  - 1. As scheduled on drawings. (Basis of Design)

- a. Porcelain Wall Tile: (PWT-1) 12"x24" as scheduled on drawings.
- b. Porcelain Floor Base Tile: (PB-1) 3"x24" as scheduled on drawings.
- c. Porcelain Floor Tile: (PT-1) 12"x24" as scheduled on drawings.

- 2. Other products that may be acceptable upon a compliance review includes:
- 3. Or approved equal
- 4. Single Source Responsibility: Provide materials obtained from only 1 source for each type of tile, mortar, grout and color to minimize variations in appearance and quality.

- B. If not indicated on the drawings, tile patterns will be issued by architect after project submittal has been issued and accepted for all products specified. Contractor to include cost of pattern in base bid price.

**2.2 TRIM AND ACCESSORIES** - Provide the following unless otherwise required by architect or job conditions. Approval of architect is required thru submittal phase.

A. Thresholds:

- 1. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes. Match depth of door jamb width.
- 2. Bevel edges at 1:2 slope aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/4 inch and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.

- 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

C. Edge Trim: At outside corners in lieu of bullnose corners contractor may provide stainless steel edge trim systems by Schluter Systems or approved equal.

- 1. Provide Schiene Edge Trim 7/16-in Stainless Steel Tile Accessories: or approved equal.
  - i. Profile is designed to finish and protect tile edges
  - ii. Prevents tile edges from chipping
  - iii. Ideal for creating transitions on walls and floors
  - iv. Ideal for floor installations, where tile abuts a dissimilar material
  - v. Made of solid stainless steel
  - vi. Ideal for environments with strict hygiene requirements
  - vii. Profile length is 8-ft and accommodates tiles that are 7/16-in thick

D. Provide bullnose tile or edge trim accessories with installation of mock-up for review by Architect for review and approval prior to final installation.

**2.3 SETTING AND GROUTING MATERIALS**

A. Manufacturers: All materials and accessories shall be from a single source manufacturer.

- 1. LATICRETE International Inc.
- 2. Other Manufacturer's include:
  - i. Bostik Findley.
  - ii. MAPEI Corporation.
  - iii. Custom Building Products.
  - iv. Or approved equal.

- 3. Warranty: Provide manufacturers (10) ten-year warranty for products to be free from defects and deterioration due to normal use and wear.

## **2.4 ADHESIVE MATERIALS**

- A. Manufacturers: All materials and accessories shall be from a single source.
  - 1. As recommended by manufacturer and in accordance with all VOC content levels. Refer to specification Division 01 for sustainable criteria.
- B. Organic Adhesive: ANSI A136.1, thin set bond type; use Type I in areas subject to prolonged moisture exposure.

## **2.5 MORTAR MATERIALS**

- A. Manufacturers: All materials and accessories shall be from a single source.
  - 1. As recommended by manufacturer and in accordance with all VOC content levels..
  - 2. For floors and walls utilize Latex fortified underlayment or leveling mortar designed for large and heavy tile, thin-bed and wall installations to meet the following physical requirements:
    - i. Shear strength (ANSI A118.15): 500 psi (3.4 MPa) Min.
    - ii. Bond strength (ANSI A118.15): 500 psi (3.5 MPa) Min.
    - iii. Smoke and Flame Contribution (ASTM E84 Modified): 0.
    - iv. Similar to LATICRETE Tri-Lite or Multi-Max Lite for large and heavy tile mortar as manufactured by LATICRETE International, Inc. or approved equal.

## **2.6 GROUT MATERIALS**

- A. Manufacturers: All materials and accessories shall be from a single source.
  - 1. As recommended by manufacturer for application on project and in accordance with all sustainable criteria in specification Division 01.
  - 2. For floors and walls utilize Epoxy Grout (Commercial) shall be non-toxic, non-flammable, non-hazardous during storage, mixing, application and when cured and shall meet the following physical requirements:
    - i. Compressive Strength (ANSI A118.3): 3800 psi (26 MPa)
    - ii. Shear Bond Strength (ANSI A118.3): 1000 psi (6.9 MPa)
    - iii. Water Absorption (ANSI A118.3): < 0.5 %
    - iv. Cured Epoxy Grout to be chemically and stain resistant to ketchup, mustard, tea, coffee, milk, soda, beer, wine, bleach (5% solution), ammonia, juices, vegetable oil, brine, sugar, cosmetics, and blood, as well as chemically resistant to dilute acids and dilute alkalis.
    - v. Similar to LATICRETE SpectraLock™ Pro Premium Grout as manufactured by LATICRETE International, Inc. or approved equal.

## **2.7 CRACK-SUPPRESSION AND WATERPROOFING MEMBRANE**

- A. All materials and accessories shall be from a single source.
- B. For floors and walls utilize Waterproofing / Crack-Suppression Membranes: shall be a thin, load bearing waterproofing/crack isolation membrane that does not require the use of fabric in the field, coves or corners. The waterproofing/crack isolation membrane shall be a single component self-curing liquid rubber polymer that forms a flexible, seamless waterproofing membrane. The waterproofing/crack isolation membrane shall bond directly to a wide variety of substrates. Equipped with Microban Anti-Microbial Protection or approved equal. The waterproofing/crack isolation membrane shall also meet the following physical requirements:
  - 1. Elongation : 250%
  - 2. Service Temperatures: Surface temperature must be 50 – 90°F (10 – 32°C) during application and for 24 hours after installation.
  - 3. 7-Day Breaking Strength (ANSI A118.10): 300 psi (2.1 MPa)
  - 4. Thickness (Dried): 20 - 30 mils (0.5 to 0.8 mm) or as required by manufacturer

5. Service Rating (TCA/ASTM C627): Extra Heavy/cycles 1-14
  6. Similar to LATICRETE Hydro Ban waterproofing / crack isolation membrane as manufactured by LATICRETE International, Inc. or approved equal.
- C. Upon a compliance review - other acceptable system products will be considered for use in locations suitable to receive the following:
1. Schluter - DITRA system and all required accessories to make the system complete. The system is a polyethylene membrane with a grid structure of square cavities, each cut back in a dovetail configuration, and an anchoring fleece laminated to its underside. Schluter-DITRA is bonded to the substrate using thin-set mortar. The anchoring fleece on the underside of Schluter-DITRA is fully engaged in the mortar to provide a mechanical bond to the substrate. Tile is installed over Schluter-DITRA using the thin-bed method in such a way that the mortar becomes mechanically anchored in the square, cutback cavities of the Schluter-DITRA matting. The system is designed specifically for ceramic tile and dimensional stone installations; performing as an uncoupling layer, waterproofing membrane, and vapor management layer that accommodates moisture from beneath the tile covering.

## **2.8 EXPANSION AND CONTROL JOING SEALANT**

- A. All materials and accessories shall be from a single source.
- B. Expansion and Control Joint Sealant to be a one component, neutral cure, exterior grade silicone sealant meeting the following requirements:
  1. Tensile Strength (ASTM C794): 225 psi (1.5 MPa)
  2. Hardness (ASTM D751; Shore A): 25 (colored sealant)/15 (clear sealant)
  3. Weather Resistance (QUV Weather-ometer): 10000 hours (no change)
  4. Water Absorption (ANSI A118.3): 0.1 %
  5. Compressive Strength (ANSI A118.3): 8379 psi (57.8 MPa)
  6. Shear Bond Strength (ANSI A118.3 Modified): 2000 psi (13.8 MPa)
  7. Similar to LATICRETE Latasil Tile and Stone Sealant as manufactured by LATICRETE International, Inc. or approved equal.

## **2.9 MISCELLANEOUS MATERIALS**

- A. All materials and accessories shall be from a single source.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials. Similar to LATICRETE 86 LatiLevel Self-Leveling Underlayment and Primer as manufactured by LATICRETE International, Inc. or approved equal.
- C. Metal Edge Strips: Angle or L-shape, stainless steel; ASTM A666, 300 Series exposed-edge material.
- D. Tile Backer Board – Refer to DIVISION 9 – Gypsum Board.
- E. Sealant and Compressible Filler: Provide flexible closed cell foam polyethylene, butyl rubber, or open cell and closed cell polyurethane, rounded at surface to contact sealant and recommended by the sealant manufacturer for open joints. Confirm to TCA installation methods for movement joints EJ171-07 or current edition. Refer to DIVISION 07 for sealant materials and accessories.
  1. Sealant: Comply with ASTM C920 or approved equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors

in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until satisfactory conditions have been corrected in a manner acceptable to Installer.

- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Prime Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

### **3.2 PREPARATION**

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
- C. Remove protrusions, bumps, and ridges by sanding or grinding.
- D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre-coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.
- F. Prepare open joints and tile edges to receive sealant. All surfaces to be dry and clean prior to setting of sealant. Use sealant recommended by tile manufacturer and in accordance with TCA installation methods for conditions encountered on site to obtain an optimum bond.
- G. Prime all tile edges to receive sealant in accordance with the manufacturer's installation guidelines and keep primer off of all finished faces / edges of tile.

### **3.3 INSTALLATION, GENERAL**

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: Current version of TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Manufacturer's Installation Guidelines: Follow the manufacturer's installation guidelines for installation, VOC requirements and sustainable guidelines in accordance with Division 01.
- D. 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. Tile to be full height on walls. Extend tile from finished floor to a minimum of 6 inches above ceiling.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- F. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- G. Movement/Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants as per manufacturer's recommendations and to comply with requirements in Division 07 Section "Joint Sealants."
  - 3. Provide joints according to TCA EJ171 Movement Joint Design.

4. Submit Shop drawings locating "Movement Joints."
  5. Maximum spacing of movement joints to be 20' maximum on center.
  6. Where tile abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes ceilings, and where changes occur in backing materials. Not at drain strainers.
  7. All expansion, control, construction, cold, and seismic joints in the structure should continue through the tile work, including such joints at vertical surfaces, or provide approved movement joints to allow for movement thru separation membrane / backing material.
  8. Interior joint widths in ceramic glazed wall tile joints 1/8" to 1/4".
  9. Joints in tile and setting materials shall never be less than the width of the saw-cut control joint width.
- H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
- I. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- J. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
1. Tile floors in wet areas.
- K. Install tile on floors with the following joint widths:
1. Paver Tile: 1/8-inch; or
  2. As selected by Architect
- L. Wall Tile: Install wall tile over level, plumb, and true wall surfaces. Level and plumb wall surfaces prior to installation of wall tile. Utilize patching and leveling material recommended by mortar and grout manufacturer for application. Submit product for review and approval prior to installation.
- M. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
- N. Metal Edge Strips: Install at locations indicated or where exposed edge of tile meets a dissimilar material or at outside corners. Provide stainless steel edge trim 2.
- O. Install tile on walls with the following joint widths:
1. Wall Tile: 1/16 inch or 1/8-inch max as selected by Architect.

### **3.4 FLOOR TILE INSTALLATION**

- A. Refer to TCA handbook for installation method related to project conditions as referenced below.
- B. Interior floor installation on concrete; mortar bed (thinset);
  1. 1<sup>st</sup> Floor slab on grade - TCA F122; or approved equal.
    - i. Tile
    - ii. Thinset Mortar: Latex - portland cement mortar.
    - iii. Grout: 100% Epoxy grout.
    - iv. Waterproof membrane / Crack suppression membrane
    - v. Concrete Slab

### **3.5 WALL TILE INSTALLATION**

- A. Refer to TCA handbook for installation method related to project conditions as referenced below.
- B. Interior wall installation over tile backer board (cementitious backer units); thin-set mortar; TCA W244; or approved equal.
  - 1. Thin-Set Mortar: Latex - portland cement mortar.
  - 2. Grout: 100% Epoxy grout.
  - 3. Waterproof membrane / Crack suppression membrane
  - 4. Tile underlayment
  - 5. Metal studs / furring

### **3.6 GUIDELINES FOR INSTALLATION**

- A. Comply with applicable ANSI standard installation specifications A108 Series and specified TCA "Handbook for Ceramic Tile Installation" specifications. Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.
  - 1. Extend tile work into recesses and under equipment and fixtures, to form complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disruption of pattern or joint alignment.
  - 2. For tile on walls and floors of shower rooms, walls of shower compartments, and drying areas comply with ANSI requirements for installation of tile in shower receptors.
- B. Setting Beds: Provide setting beds in accordance with applicable TCA specification or match adjacent work in alterations, unless otherwise specified.
- C. Jointing Pattern: Unless otherwise required for matching, lay wall tile in grid pattern. Align joints when adjoining tiles on floor; base walls and trim are same size. Layout tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths. Coordinate layout with tile patterns issued by Architect during construction sequence.
- D. Expansion and Control Joints: Provide where shown on structural drawings and as recommended in applicable TCA specification. Install removable divider strips of same depth as finished tile system, including setting beds. Remove strips of same depth as finished tile sealants in accordance with DIVISION 07. Submit shop drawings noting movement joint locations prior to installation. Provide all movement joints according to TCA EJ171 Movement Joint Design, or approved equal.
- E. Marble Threshold Installation: Thoroughly clean concrete slab before setting marble. Set level and square in full mortar setting bed. Use materials and methods providing full uniform bearing on setting bed, firm bonding to substrate and marble, and no staining of marble. Fill end joints with grout made non-staining white Portland cement.

### **3.7 ADJUSTING/PROTECTION / CLEANING**

- A. Cleaning: Clean unglazed tile with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than (10) days after installation. Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile. Clean excess mortar/epoxy from veneer surfaces with water before they harden and as work progresses. Do not contaminate open grout/caulk joints while cleaning. Sponge and wash veneers diagonally across joints. Polish with clean dry cloth. Remove surplus materials and leave premises broom clean.
- B. Protection: Protect installed ceramic tile in accordance with manufacturer's instructions. Provide minimum protection with kraft paper or other heavy covering during construction period to prevent damage and wear. Prohibit foot and wheel traffic from using tiled floors for at least (4) days after grouting is completed. Before final inspection, remove protective coverings and rinse cleaner from tile surfaces. Use kneeling boards, or equivalent, to walk/work on newly tiled floors. Extend period of protection of tile work at lower temperatures, below 60°F (15°C), and at high relative humidity (>70%



R.H.) due to retarded set times of mortar/adhesives. Replace or restore work of other trades damaged or soiled by work under this section.

1. Epoxy Adhesive: Keep floors installed with epoxy adhesive closed to traffic for 24 hrs at 70°F (21°C), and to heavy traffic for 48 hours at 70°F (21°C) unless instructed differently by manufacturer.
- C. Dispose of waste in accordance with project requirements and local jurisdiction requirements.
- D. Comply with waste management and recycling program requirements.

END OF SECTION

## **SECTION 095100 - ACOUSTICAL PANEL CEILINGS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, acoustical panels and exposed suspension systems for ceilings.
  - 1. Acoustical panel ceilings installed in exposed suspension system for new installations of acoustical ceilings.
  
- B. RELATED SECTIONS
  - 1. Division 07 – Thermal Insulation
  - 2. Division 09 – Painting
  - 3. Division 09 – Gypsum Board Assemblies
  - 4. HEATING WORK DIVISION: Grilles, registers, and diffusers in acoustical ceilings.
  - 5. ELECTRIC WORK DIVISION: Lighting fixtures, fire alarm, and smoke detection system installed in acoustical ceilings.
  - 6. PLUMBING WORK DIVISION: Sprinkler heads installed in acoustical ceilings.

#### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM A641 - Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 2. ASTM C635 - Specification for Metal Suspension Systems for Acoustical tile and Lay-In Panel Ceilings.
  - 3. ASTM C636 - Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
  - 4. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 5. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
  - 6. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 2000.
  - 7. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998.
  - 8. USGBC LEED-NC - LEED Green Building Rating System for New Construction, U.S. Green Building Council.

#### **1.3 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 SUBMITTAL PROCEDURES.
  
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: Submit manufacturer's product literature and specifications for each type of acoustical panel and suspension system demonstrating compliance with specified requirements. For each product indicated.
  
- C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Samples: For each acoustical panel, for each exposed suspension system member, for each exposed molding and trim, and for each color and texture required.
1. Initial Selection: Submit manufacturer's color charts consisting of actual acoustical units or sections of units showing full range of colors, textures, and patterns available for each type of unit specified.
  2. Verification: Submit samples of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and materials specified for installation for Architect's review of color and texture; compliance with specified requirements remains Contractor's exclusive responsibility. Where finishes involve normal color and texture variation, include sample sets showing full range of expected variation.
    - a. Acoustical Panel: 6-inch x 6-inch samples of each type, pattern, and color specified.
    - b. Exposed Suspension System: Set of 12-inch long samples of all members including moldings for each color and system type specified.
- E. Quality Control Submittals
1. Installer Experience: Submit list of completed projects with project names, addresses, names of architects and owners within the last 5 years.
- F. Product test reports.
- G. Research / evaluation reports.
- H. Maintenance data.
- I. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
1. Sustainability / Environmental Submittals: Show evidence including, but not limited to the following:
  2. Recycled content – documentation showing product supports pre and post - consumer content.
  3. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  4. Proposed products are manufactured within a 500-mile radius of the project site and is locally produced material which supports regional materials and resources.
  5. Comply with recycling program and waste management procedures.
  6. Comply with optimizing energy performance.
- J. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
1. Requirements of Division 01 CLOSEOUT PROCEDURES;
  2. Submission of maintenance instructions described in Division 01 OPERATION AND MAINTENANCE DATA;
  3. Record documents as described in Division 01 PROJECT RECORD DOCUMENTS;
  4. Demonstration and training requirements indicated in Division 01 DEMONSTRATION AND TRAINING.

#### **1.4 WARRANTY**

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
1. Acoustical Panels: Sagging and warping
  2. Grid System: Rusting and manufacturer's defects

- B. Warranty Period:
  - 1. Acoustical panels: Ten (10) years from date of substantial completion.
  - 2. Suspension: Ten (10) years from date of substantial completion.
  - 3. Ceiling System: Thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

## **1.5 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Single Source Responsibility: Obtain each type of acoustical ceiling unit and suspension system from single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of Project.
  - 2. Installer: Experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for this Project.
  - 3. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
  - 4. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum (3) three-years of experience.
- B. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.
- C. Fire-Test-Response Characteristics:
  - 1. Fire-Resistance Ratings: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Ratings are indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
    - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class materials, when tested per ASTM E 84.
    - a. Smoke-Developed Index: 450 or Less.
- D. Seismic Standard: Comply with the following:
  - 1. ASTM E C 636 for Seismic Category "C" refer to structural drawings.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Build mockups as directed by Architect.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## **1.6 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. Acoustical Ceiling Units: Full-size units equal to 5 percent of quantity installed.

2. Suspension System Components: Quantity of each exposed component equal to 5 percent of quantity installed. If approved by Architect.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver acoustical ceiling units to Project site in original, unopened packages, bearing manufacturer's name and label identifying each type of acoustic unit.
- B. Storage and Protection
  1. Store acoustical ceiling units in unopened packages in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and other causes.
  2. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
  3. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

#### **1.8 PROJECT/SITE CONDITIONS**

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

#### **1.9 SEQUENCING AND SCHEDULING**

- A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition system.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  1. As a basis of design, details and specifications have been based on Armstrong World Industries; or approved equal.
- B. Other Manufacturer's that may be acceptable upon a compliance review include:
  1. USG Corporation: [www.usg.com](http://www.usg.com)
- C. Acoustical Units – General: ASTM E 1264, Class A.
  1. Acoustical Panels Type (C-1) as defined on drawings
    - a. Surface Texture: Fine
    - b. Composition: Mineral Fiber
    - c. Color: White
    - d. Size: 24 in x 24 in
    - e. Edge Profile: Beveled Tegular 9/16 in for interface with SUPRAFINE ML 9/16" Exposed Tee grid.
    - f. Noise Reduction Coefficient( NRC): ASTM C 423; Classified with UL label on product carton 0.80
    - g. Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 35
    - h. Sabin: N/A

- i. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 170
- j. Flame Spread: ASTM E 1264; Class A (UL)
- k. Light Reflectance (LR) White Panel: ASTM E 1477; 0.88
- l. Dimensional Stability: HumiGuard Plus
- m. Recycle Content: Post-Consumer - 0% - 1% Pre-Consumer - 68% - 75%
- n. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
- o. Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
- p. Acceptable Product: ULTIMA High NRC, 1942 No added formaldehyde as manufactured by Armstrong World Industries

## **2.2 GENERAL**

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
  - 1. Anchors in Concrete: Anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to (5) times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
  - 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 per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 1. Size: Select wire diameter so its stress at (3) times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 12 Gage diameter wire.
- E. Provide Seismic Struts and Seismic Clips to comply with code requirements.
- F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

## **2.3 METAL SUSPENSION SYSTEM**

- A. Product: Specified as a basis of design - Armstrong – Suprafine XL (HRC), or approved equal.
  - 1. Other Products, that may be acceptable upon compliance review - USG Building Systems
- B. Comply with applicable requirements of ASTM C635 for specified type, structural classification and finish.
  - 1. Finish and Color: Provide finish and color as specified below for type of suspension system. In Toilet Rooms and where "high-humidity finish" is indicated on Drawings, comply with ASTM C635 requirements for "Coating Classification for Severe Environment Performance".

2. Attachment Devices: Where hanger wires cannot be directly wire-tied to structural or intermediate framing members, provide attachment devices designed for type of construction with carrying capacity of not less than (5) times of the design loads indicated in ASTM C635, Table 1, Direct Hung.
  3. Wires for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper; minimum 12 Gage diameter; provide larger diameter if recommended by suspension system manufacturer for applications shown on Drawings.
  4. Edge Moldings and Trim: Hot dipped galvanized of types and profiles indicated, finished to match metal suspension system components.
    - a. Unless otherwise specified, provide manufacturer's standard angle or channel molding for edges and penetrations of ceiling, with single flange of molding exposed.
  5. Accessories:
    - a. Hold-Down Clips: Manufacturer's standard steel clips for ceiling composed of lay-in panels weighing less than 1 lb. per square foot.
    - b. Impact Clips: manufacturer's standard impact clip system designed to absorb impact forces against lay-in panels.
- C. Steel Suspension System: Main and cross-runners roll-formed from pre-painted hot dip galvanized color-rolled steel sheet, with pre-painted 9/16 inch wide flanges; painted white finish, unless otherwise specified.
1. Structural Classification (ASTM C635): Heavy Duty classification.
  2. Products complying with these requirements include:
    - a. Suprafine XL (HRC) by Armstrong World Industries, Inc.

## **2.4 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid. Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Touch-up Paint: Type and color to match acoustical and grid units.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which acoustical panel ceilings are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractors in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

### 3.2 PREPARATION

- A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors as required for installation well in advance of time needed for installation of ceiling systems. Do not install acoustic ceilings until installation areas meet the following requirements:
1. Exterior openings have been closed and roofs are weather-tight.
  2. Mechanical, electrical and other construction above ceilings has been completed.
  3. "Wet" construction has been completed.
  4. Temperature and relative humidity have reached levels complying with acoustic material manufacturer's recommendations for units to be used and are acceptable to Installer.
- B. Measurements: Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-quarter-width units at borders, and comply with reflected ceiling plans. Arrange acoustical units and orient directionally patterned units in manner shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. 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 tiles at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices.
1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
  2. Do not attach hangers to steel deck tabs.
  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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  4. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Space hangers not more than 4 ft. o. c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate with concealed fasteners 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.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.



1. Support main runners directly from hangers; do not bear on walls or partitions. Space main runners to support acoustic panels and other items resting in, or on, ceiling, as required to comply with specified performance requirements. Interlock cross-runners with either main runners or with cross-runners structurally classified as main runners.
- F. 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.
- G. Acoustical Panel Installation: Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
  1. Install hold-down clips within 20 feet from all entrances and vestibules and in areas where required by governing regulations or fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

### **3.4 CLEANING**

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- B. Dispose of waste legally and in accordance with local jurisdiction requirements.
- C. Comply with waste management and recycling program requirements.

END OF SECTION - 095100

## **SECTION 096500 – SOLID VINYL FLOOR TILE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes but is not limited to the following:
  - 1. Solid vinyl floor tile.
  - 2. Resilient tile flooring.
  - 3. Resilient base.
  - 4. Resilient accessories.
  - 5. Installation accessories.

#### **1.2 RELATED REQUIREMENTS**

- A. Division 01 – Specifications
- B. Division 03 – Concrete
- C. Division 09 – Concrete Preparation
- D. Division 09 – Modular Carpet

#### **1.3 REFERENCE STANDARDS**

- A. ASTM International:
  - 1. F 1700 Standard Specification for Solid Vinyl Floor Tile
  - 2. E 648 Standard Test Method for Critical Radiant Flux of Flooring Systems using a Radiant Energy Source
  - 3. E 662 Standard Test Method for Specific Density of Smoke Generated by Solid Materials
  - 4. F 970 Standard Test Method for Static Load Limit
  - 5. D 2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
  - 6. DIN 51130 Determination of the anti-slip property - Workrooms and fields of activities with slip danger, walking method - Ramp test
  - 7. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; current edition.

#### **1.4 SUBMITTALS**

- E. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 SUBMITTAL PROCEDURES.
- F. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
- G. Shop Drawings: Submit shop drawings showing layout, seaming diagram, finish colors, designs and textures.
- H. Samples: Submit 6" selection and verification samples for finishes, colors, designs and textures for colors indicated on the contract drawings for Architect's review. Final color selection by Architect.
- I. Verification Samples: Submit two samples, 6" x 6" in size illustrating color and pattern for each resilient flooring product specified.
- J. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable for installation.

- K. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance..
- L. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
  - 1. Indicate percentages by weight of post-consumer and pre-consumer recycled content for each product having recycled content.
  - 2. Include statement indicating cost for each product having recycled content.
  - 3. Indoor Air Quality: product manufacturer and related VOC content for all non-preformed Sealants, Primers, and Adhesives.
  - 4. Proposed products are manufactured within a 500-mile radius of the project site and are considered to be a locally produced material which supports regional materials and resources.
  - 5. Comply with recycling program and waste management procedures.
  - 6. Sustainable Items: Recycled content, optimize energy performance and regional materials.
- M. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
  - 1. Requirements of Division 01 CLOSEOUT PROCEDURES;
  - 2. Submission of maintenance instructions described in Division 01 OPERATION AND MAINTENANCE DATA;
  - 3. Record documents as described in Division 01 PROJECT RECORD DOCUMENTS;
  - 4. Demonstration and training requirements indicated in 0 Division 01 DEMONSTRATION AND TRAINING.

## **1.5 QUALITY ASSURANCE**

- A. Single Source of Supply: Obtain each type and color of base and accessory from single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of Project.
- B. Installer Qualifications: Installer to be certified by manufacturer with a minimum of (5) five years of in-service experience. Provide evidence of five (5) successful projects. Provide owner name, contact information, project location and scope description along with manufacturer certification. Installers are to be tradesmen who are competent in techniques required by manufacturer for resilient flooring installation indicated.
- C. Quality assurance submittals: Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- D. Manufacturer Qualifications:
  - 1. ISO 9001 Certified
  - 2. ISO 14001 Certified
  - 3. OHSAS 18001 Certified
  - 4. At least ten years' active experience in the manufacture and marketing of commercial flooring.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver base and accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Storage and Protection
  - 1. Store product in dry spaces protected from weather with ambient temperatures maintained between 65 Degrees F and 85 Degrees F.
  - 2. Move products into spaces where they will be installed at least 48 hours in advance of installation.

### **1.7 PROJECT / SITE CONDITIONS**

- A. Maintain temperatures within range recommended by manufacturer, but not less than 65 Degrees F or more than 85 Degrees F, in spaces to receive floor products and adhesives during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Do not install products until they are at the same temperature of the interior space they are to be installed within.
- C. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 65 Degrees F or more than 85 Degrees F.
- D. Install resilient products after other finishing operations, including painting, have been completed.
- E. Maintain room temperature at minimum of 50 Degrees F.

### **1.8 SEQUENCING AND SCHEDULING**

- A. Close spaces to traffic during installation.
- B. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.
- C. Finishing operations: Install floor covering after finishing operations; including painting and ceiling operations have been completed.
- D. Concrete curing and drying: Do not install floor covering over concrete substrates until substrates have cured and are dry to bond with adhesive as determined in test methods specified in ASTM F710.

### **1.9 WARRANTY**

- A. Resilient Flooring materials: Submit a (1) year written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period including all labor costs commencing on the date of substantial completion.
- B. Surface Wear Warranty Period: (12) Twelve years from the date of substantial completion including pro-rated labor cost.
- C. Rights - The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.
- D. Validation – Install product using the Manufacturers Installation System and techniques.

### **1.10 MAINTENANCE**

- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project as attic stock.
  - 1. Extra Flooring Material: 60 S.F. or 5% of each type and color (whichever is greater).
  - 2. Extra Wall Base: 100 linear feet of each type and color.
  - 3. Delivery, Storage and Protection: Comply with the owner's requirements for delivery, storage and protection of extra materials.
- B. Maintenance of finished floor covering shall be according the manufacturer's maintenance instructions.

## **PART 2 - PRODUCTS**

### **2.1 VINYL TILE FLOORING (LUXURY VINYL TILE – LVT)**

- A. Product Description:
1. Size: 7 in. x 48 in.
  2. Thickness: .100 inch (2.5 MM)
  3. Composition:
    - a. POLYURETHANE COATING: UV-cured coating, reinforced with silica beads, that provides excellent stain and abrasion resistance, eliminates the need for wax, polishes and harsh chemicals—reduced maintenance costs and contributes to improved IAQ.
    - b. TRANSPARENT WEAR LAYER: 0.70 mm (28 mil) Transparent Wear Layer. Hard-wearing, provides long lasting appearance retention in heavy commercial traffic environments. Superior performance versus traditional 0.50” (20 mil) & 0.55” (22 mil) wear layers.
    - c. PRINTED LAYER: This layer utilizes high definition print film for stunning, eye-perfect, authentic visuals.
    - d. CORE AND BACKING LAYERS: Our high content, 100% virgin vinyl core and backing ensures excellent dimensional stability, impact resistance and durability.
    - e. Construction / Properties:
      1. Finish – Proguard
      2. Edge Profile – Micro Bevel
      3. Critical Radiant Flux (ASTM E648)- Pass - Class I
      4. Smoke Density (ASTM E662) Pass - <450
      5. Flexibility (ASTM F137) - Pass
      6. Heat Stability by Color Change (ASTM F1514) - Pass
      7. Light Stability (ASTM F1515) - Pass
      8. Static Coefficient of Friction (ASTM D2047) - Pass
      9. Dimensional Stability (ASTM F2199) - Pass
      10. Resistance to Chemicals (ASTM F925) - Pass
      11. Static Load Limit (ASTM F970) - Pass
    - f. Installation - Glue down
    - g. Tile Size - 7” x 48” (17.78 cm x 121.92 cm)
    - h. Pieces Per Box - 15
    - i. Weight Per Box - 29.10 lb (13.20 kg)
    - j. Quantity Per Box - 35.0 ft<sup>2</sup> (3.25 m<sup>2</sup>)
    - k. Warranty:
      1. 12-Year Limited Commercial Wear
      2. 1-Year Manufacturing Defect Warranty
  4. Color: As scheduled on drawings; or as selected by Architect from full range of standard and premium colors.
  5. Pattern: As scheduled on drawing; if not scheduled than as selected by Architect upon approval of product submittal.
  6. Products/Manufacturers:
    - a. High Performance Luxury Vinyl Tile (VT-1) Flooring as manufactured by Milliken Company [www.millikenfloors.com](http://www.millikenfloors.com).
      1. Wood – Kokutan or selected by architect from full range of options.
      2. Classification: ASTM F 1700, Class III, Type B
      3. Thickness: 0.098” (2.5mm)
      4. Wear Layer Thickness: 28 mil (0.70mm) – exceeds ASTM F 1700 specification for commercial use

5. Size: 7" x 48" (177.8mm x 1219.2mm)
  6. Color (select): KOK145; or as selected by the Architect from full range of options.
  7. Manufacturer's warranty period: 12 year limited commercial warranty commencing on date of substantial completion.
  8. Or approved equal.
7. Performance Criteria:
- a. Description: Solid Vinyl Tile
  - b. Dimensional Stability per ASTM F 2199
  - c. Recovery from Long Term Indentation per ASTM F 970 modified – 1,000psi
  - d. Determination of anti - slip properties DIN 51130 – R10
  - e. Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine – ASTM D2047 - Pass
  - f. Chemical resistance per ASTM F 925 – Excellent, results on request
  - g. Flexibility per ASTM F 137 – Pass
  - h. Fire Performance: ASTM E648; Class 1
  - i. Slab Moisture Tolerance
    1. When Maximum Relative Humidity (RH) of 95% when tested according to ASTM F2170.
    2. Maximum moisture vapor emission rate of 10 pounds of water per 1,000 square feet in 24 hours when tested according to ASTM F1869.
- B. Adhesive
1. Provide Milliken LVT Adhesive or approved equal. Install in accordance with the recommended installation requirements by the flooring manufacturer.
- C. Accessories
1. Patching - For patching, smoothing, and leveling monolithic subfloors (concrete slab on grade and topping slabs), provide manufacturers suggested setting and leveling materials.
  2. Sealing / Cleaning - as recommended by the flooring manufacturer.
  3. Transition - Provide transition/reducing strips tapered to meet abutting materials.

## **2.2 RESILIENT BASE**

- A. Resilient Base (RC-1): Toe Cove, and as follows:
1. Height: 4 inch.
  2. Thickness: 0.125 inch thick.
  3. Finish: Satin.
  4. Length: Roll.
  5. Color: See contract drawings for finish schedule selections.
  6. Manufacturers:
    - a. Roppe Corp: [www.roppe.com](http://www.roppe.com) – Basis of Design – See schedule on drawings.
  7. Other manufacturer's that may be acceptable upon a compliance review include:
    - a. Burke Flooring: [www.burkemercer.com](http://www.burkemercer.com).
    - b. Johnsonite, Inc: [www.johnsonite.com](http://www.johnsonite.com).
    - c. Or approved equal

## **2.3 RESILIENT FLOORING ACCESSORIES**

- A. Accessories: Provide accessory products specified below in color as selected by Architect from manufacturer's full range of colors. Confirm field conditions on site are suitable for products and profiles specified below before ordering. Modify profiles to suit field conditions encountered. Submit products

with shop drawing and material schedule identifying location and use for product and profile and obtain Architects approval before ordering.

1. Provide profiles as required to meet project conditions encountered, submit in shop drawings to identify suggested products, locations, and applications.

## **2.4 ACCESSORIES**

- A. Sub floor Filler: White premix latex; type recommended by adhesive material by flooring manufacturer.
- B. LVT Underlayment:
  1. Made with high-density polyurethane foam,
  2. Reduces floor noise by providing excellent sound absorption,
  3. Made of 100% recyclable and environmentally friendly,
  4. Contains anti-microbial treatment suitable for quick and easy installation suitable for glue down and Free Lay LVT installations.
- C. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- D. Filler for Coved Base: As per manufacturer's recommendations and in accordance with all sustainable specifications and recommendations.
- E. Concrete Slab Primer: Non-staining type recommended by flooring manufacturer.
- F. Adhesive: Provided by tile manufacturer for applications shown on Drawings.
- G. Concrete Floor Patching and Leveling Materials acceptable to the finished floor system manufacturer or approved equal: (Select one of the following patching methods to address project field conditions encountered) Submit proposed repair options to the Architect for review, comment, or approval:
  1. Repair products to be used as an underlayment material to receive a floor finish: (in offices, break rooms, etc...)
    - a. Flash Patching: Portland cement-based self-drying cementitious flash patching material similar to "Ardex Feather Finish".
    - b. Patching: Portland cement-based self-drying cementitious patching material similar to "Ardex SD-P".
    - c. Self-Leveling Topping: Portland cement-based cementitious self-leveling material similar to "Ardex K-15".
    - d. Or approved equal
    - e. Or provide a suitable product for use based on the field conditions encountered. Submit proposed products to Architect and Engineer for review and approval prior to installing the work.
  2. Repair products to be used as a finished wearing surface: (in similar spaces such as storage areas, mechanical rooms, garage areas)
    - a. Flash Patching / Patching: Trowel grade cement-based self-drying cementitious flash patching material similar to Ardex CP "Concrete Patch".
    - b. Self-Leveling Topping: Portland cement-based cementitious self-leveling material similar to "Ardex K-500". Product to be sealed with a compatible sealer. Utilize a primer to promote bonding. Product can be installed from .25" to 1.5" thickness without aggregate. Any installation over 1.5" aggregate (pea gravel 1/8" to 3/8") must be added to the mix in the proportions recommended by the manufacturer.
    - c. Or approved equal
  3. Prepare, clean, and scarify existing concrete floor to receive patching and leveling products in accordance with the manufacturer's installation instructions and recommendations. Remove all debris, paint material, grease, oil, and stains on concrete slab. Patch floor to level condition with adjacent surfaces. Apply concrete sealer to concrete floor surfaces at the conclusion of the work.
  4. Ensure compatibility of patching material and sealer in writing with submittal.

5. Install all products in accordance with the manufacturer's installation instructions, procedures, and compatible materials.
- H. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions.
- I. Sealer: As recommended by manufacturer, provide topical sealer on products. Sealer to be a high quality cross linked acrylic floor polish containing 16% to 25% solids. Sealer to be installed over all resilient floors upon completion of installation prior to Owner's occupancy. Install sealer in accordance with the manufacturer's recommended installation instructions and installation guidelines of the floor product manufacturer. Sealer to confirm to slip resistant coefficients required by ADA.

### **PART 3 – EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- D. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- E. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- F. Moisture Test - Perform subfloor moisture testing in accordance with the manufacturer's installation requirements and project conditions or approved equal:
  1. ASTM F 2170, 'Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes'
  2. ASTM F 1869, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride' and Bond Tests as described in publication Armstrong Guaranteed Installation Systems manual, F-5061 to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.
    - a. Relative humidity shall not exceed 75%.
    - b. MVER shall not exceed 3 lbs. / 1000 sq. ft. / 24 hrs.
    - c. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.
  3. PH Test - Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.



- G. Verify that required floor-mounted utilities are in correct location.

### 3.2 PREPARATION

- A. Surface Preparation: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.
1. Use trowelable leveling and patching compounds per flooring accessory manufacturer's directions to fill cracks, holes, and depressions in substrates.
  2. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a concrete grinder, drum sander, or polishing machine equipped with heavy-duty wire brush.
  3. Broom or vacuum clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
  4. Apply concrete slab primer, if recommended by flooring accessory manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.
- B. Prepare sub-floor surfaces as recommended by flooring and adhesive manufacturers requirements.
1. Concrete substrate: Reference Standard ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
    - a. Concrete Moisture Test: Per ASTM F 710 section 5 Persons or testing agencies with experience in concrete moisture testing shall perform moisture tests on concrete regardless of its age or grade level or history of use, with a minimum of three tests for the first 1,000 square feet and one additional test for each 1,000 square feet or fraction thereof. A diagram of the area showing the location and results of each test shall be dated and submitted to the architect, designer, general contractor and/or end user. If the test results exceed the floorcovering manufacturer's expressed limits, installing shall not commence until results conform to limits
    - b. Concrete pH Test: Perform pH tests on concrete regardless of its age or grade level or history of use. Readings below 7.0 and above 10.0 can adversely affect resilient flooring or adhesives or both.
- C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- D. Prohibit traffic until filler is cured.
- E. Clean substrate.

### 3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install all products in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place; press with heavy roller to attain full adhesion.
- F. Where the types of floor finish, pattern, and/or color are different on the opposite sides of the door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated on contract documents.
1. Resilient Strips: Attach to substrate using adhesive.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.4 TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed; unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- C. Install tile in accordance with manufacturer's installation requirements.
- D. Allow minimum 1/2 full size tile width at room or area perimeter.

### **3.5 RESILIENT BASE**

- A. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
  - 1. Inside and Outside corner installation: (at masonry wall applications)
    - a. Job-Formed Corners:
      - 1) Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
      - 2) Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.
- B. Fit joints tightly and make vertical. Maintain minimum dimension of 72 inches between joints.
- C. At external corners of drywall construction, use pre-molded units. At exposed ends, use pre-molded units.
- D. Install base on solid backing. Bond tightly to wall and floor surfaces.
- E. Scribe and fit to door frames and other interruptions.

### **3.6 RESILIENT ACCESSORIES**

- A. Resilient Accessory Installation: Comply with manufacturer's installation instructions. Place resilient accessories so that they are butted to adjacent materials of type indicated and bond to substrates with adhesives. Install reducer strips at edges of flooring that otherwise would be exposed.

### **3.7 CLEANING**

- A. Perform following operations 5 days after completing installation in accordance with manufacturer's requirements and guidelines.
  - 1. Follow manufacturer's initial cleaning procedures and final cleaning requirements.
  - 2. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturer.
  - 3. Sweep or vacuum floor thoroughly.
  - 4. Do not wash floor until after time period recommended by manufacturer.
  - 5. Dust-mop tile to remove marks and soil.
- F. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions. Comply with sustainability requirements listed in specifications Division 01.
- C. Comply with waste management and recycling program requirements.
- D. Dispose of all materials legally.

### **3.8 PROTECTION**

- A. Protect all flooring and accessories against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by the manufacturer.
  - 1. Keep foot traffic off of new floor for 24 hours minimum and furniture, fixtures, and rolling traffic off for 48 hours minimum.
  - 2. Cover resilient accessories with un-dyed, untreated building paper until inspection for Substantial Completion.
- B. Clean products not more than 5 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean using method recommended by tile manufacturer.
- C. Dispose of waste legally and in accordance with local jurisdiction requirements.
- D. Prohibit traffic on resilient flooring for 48 hours after installation. Replace all damaged materials.

### **3.9 SCHEDULE**

- A. See contract drawings for floor finish plan and finish locations.

END OF SECTION - 096500

## **SECTION 096813 - MODULAR CARPET**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes but is not limited to the following:
  - 1. Manufacturers
  - 2. Testing Protocols
  - 3. Performance Requirements
  - 4. Product Specifications
  - 5. Environmental Requirements
  - 6. Warranties
  - 7. Exclusions
  - 8. Installation
  - 9. Maintenance
  - 10. Accessories
  - 11. Carpet Reclamation Procedures

#### **1.2 REFERENCES**

- A. American Association of Textile Chemists and Colorists (AATCC)
  - 1. AATCC 16 – Test Method for Colorfastness to Light
  - 2. AATCC 134 – Test Method for Electrostatic Propensity of Carpets.
  - 3. AATCC 165 – (93) Test Method for Colorfastness to Crocking: Carpets – AATCC Crock Meter Method
  - 4. AATCC 175 - (98) Test Method for stain Resistance: Pile Floor Coverings
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM D2646
  - 2. ASTM D418 - (12), Methods for Testing Pile Yarn Floor Covering Construction (Finished Pile Thickness only)
  - 3. ASTM E648 – Test Method for Critical Radiant Flux of Floor Covering Systems using a Radiant Heat Energy Source.
  - 4. ASTM E662 – Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
  - 5. ASTM E-1745 Vapor Retarder
  - 6. ASTM 710-11 Floor Preparation
  - 7. ASTM F2170 – Test Method
  - 8. ASTM D 2859 or CPSC FF-1-70 Methenamine Pill Test
- a. International Standards Organization (ISO)
  - 1. ISO 9001 or 9002 – standards for quality management systems as established by the International Organization for Standardization
- b. Carpet and Rug Institute (CRI)
  - 1. CRI Indoor Air Quality Testing and Labeling Program

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Comply with the following quality and performance testing requirements:
  - 1. CRI TARR Rating: “Severe” or “Heavy” using ASTM D-5252 Hexapod Tumble Test. Value must be 3.0 or higher to ensure appearance retention in high traffic areas such as school classrooms (rating of 3.0) and corridors (rating of 3.0 – 3.5).

2. Noise Reduction Coefficient, ASTM C423: 0.20 minimum. 0.25 for LEED facility.
3. ASTM D 2859 or CPSC FF-1-70 Methenamine Pill Test: Pass.4
4. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
5. Dry Breaking Strength: Not less than 100 lbf according to ASTM D2646.
6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2% or less according to ISO 2551 (Aachen Test).
8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
10. ASTM E 648, Critical Radiant Panel Flux Class I, not less than 0.45 watts per square centimeter.
11. AATCC 16, Option E: Minimum rating of 4 on grey scale after 80 hours exposure.
12. ASTM E 662 (NFPA 258): Smoke density less than 450 optical density.
13. AATCC 165: Minimum rating of 4 wet and dry.
14. AACHEN Test (DIN Standard 54318): Dimensional stability 0.2% shrinkage or growth.

#### **1.4 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in 013300 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
- C. Manufacturer's Data:
  1. Submit two (2) copies of manufacturer's specifications and installation instructions for modular carpet and related items specified.
- D. Fiber Requirements:
  1. Submit certification from the fiber producer verifying the following:
  2. Use of the specified fiber in the submitted carpet product.
- E. Warranties:
  1. Submit warranties.
- F. Maintenance:
  1. Maintenance Manual – submit manual of carpet manufacturer's recommendations for the general care, cleaning and maintenance of modular carpet products.
- G. Certificate of Compliance:
  1. Submit certified test reports that modular carpet meets all the performance requirements specified. Submit certified test reports from a NVLAP Certified Lab that carpet meets all performance criteria.
- H. Shop Drawings:
  1. For carpeted areas submit shop drawings showing installation of carpeting, pattern direction, necessary installation accessories, and provisions for work of other trades. Show location of different patterns or styles of modular carpet. Also show locations of any threshold conditions
  2. Supply reproducible prints for shop drawing submission.
- I. Samples:
  1. Submit standard-size modular carpet samples of each type of carpet, in each specified pattern, color and construction.

2. Follow substitution requirements in accordance with Division 01.
  - a. Final Sample Submittal – Submit two (2) sets of samples for each carpet type.
  - b. Carpet shipments are not permitted until acceptance of final shop drawings and samples are approved by the architect for the project.
  - c. Custom Color as selected by the architect. Manufacturer shall certify that the sample color, pattern and texture, meet the quality color samples. Architect shall review and comment or approve samples.
  - d. Samples submitted are assumed to be the manufacturer’s best obtainable match to the color selection request and are representative of the product being provided on the project.
  - e. Manufacturer must have federally registered branded trademark.
  
- J. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
  1. Sustainability / Environmental Submittals: Show evidence including, but not limited to the following:
  2. Recycled content – documentation showing product supports pre and post - consumer content.
  3. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  4. Proposed products are manufactured within a 500-mile radius of the project site and are a locally produced material which supports regional materials and resources.
  5. Comply with recycling program and waste management procedures.
  
- K. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
  1. Requirements of Division 01 CLOSEOUT PROCEDURES.
  2. Submission of maintenance instructions described in Division 01 OPERATION AND MAINTENANCE DATA;
  3. Record documents as described in Division 01 PROJECT RECORD DOCUMENTS.
  4. Demonstration and training requirements indicated in Division 01 DEMONSTRATION AND TRAINING.

## **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data
  1. Include maintenance procedures, recommended cleaning and stain removal materials, and recommended cleaning schedule. Include product data and Material Safety data Sheets (MSDS) for cleaning and stain-removal materials.
  
- B. Installation Instructions
  1. Include detailed installation procedures. Include modular installation procedures, adhesive types, trowel sizes, spread rates, open times, and Material Safety data sheets (MSDS) for all modular adhesives.
  
- C. Warranties and Performance Certifications
  1. Submit written warranties for all products as well as Performance testing results on all items included in Warranty section including all testing results mandated by manufacturer’s warranty on products and performance section of this specification.

## **1.6 QUALITY ASSURANCE**

- A. Single Source Responsibility: Provide products from a single manufacturer.
  1. Warranties must be standard and not job specific.
  2. All styles must come from the same manufacturer.
  3. Must be single source fiber extrusion and yarn manufacturing.

## **1.7 QUALIFICATIONS**

- A. Manufacturer:
  - 1. Company specializing in manufacturing modular tiles with minimum five (5) years (documented) experience.
- B. Installer/Flooring Contractor Qualifications:
  - 1. Carpet contractor shall be a firm established not less than five (5) years and shall submit evidence of having furnished and installed commercial carpet with vinyl backings on commercial carpet projects of similar size and scope for at least five (5) years.
  - 2. Flooring Contractor to provide references.
  - 3. Carpet Contractors must also be mill certified for installing products.
  - 4. Carpet Contractor will be responsible for the proper product installation, including floor preparation, in those areas indicated in the Drawings.

## **1.8 PRE-INSTALLATION MEETINGS**

- A. Convene a minimum of one (1) week prior to commencing work of this section.
- B. Require attendance of manufacturer, installer, contractor, owner, architect, and owner's representative or other parties directly affecting the work of this section.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- A. Deliver modular carpet in sealed protective boxes and accessories in sealed containers from the manufacturer. Segregate each modular product (if several product styles are involved), according to style, color, pattern, dye lot, run number, and quantity.
- B. Store products in an enclosed and dry area protected from damage and soiling.
- C. Carpet tiles shall be stored between 40° F and 100° F and shall be conditioned to between 60° F and 90° F for 48 hours prior to installation.

## **1.10 SITE ENVIRONMENTAL REQUIREMENTS**

- A. Do not install modular carpet until all areas have been fully enclosed and the environmental conditions have reached the levels desired for occupancy of the space.
- B. Maintain ambient temperature and humidity conditions during and after installation of modular carpet at occupancy levels.
- C. Allow modular carpet to reach room temperature, or minimum temperature recommended by manufacturer prior to the start of the installation.
- D. Protect adhesives from freezing. Follow manufacturer's recommendations for minimum temperatures to which adhesives are exposed.
- E. Coordinate carpet tile work with raised floor system requirements.

## **1.11 FIELD MEASUREMENTS**

- A. Verify that field measurements are as indicated on drawings.

## **1.12 SEQUENCING**

- A. Sequence installation to minimize possibility of damage and soiling of carpet.
- B. Do not commence installation until painting and finishing work are complete, and ceiling and overhead work have been tested, approved, and completed.

### **1.13 WARRANTY**

- A. Warranty Performance Requirements:
  - 1. Warranties must be for Lifetime on all items.
  - 2. Lifetime warranties must cover face components and backing components
  - 3. Warranties must be non-prorated.
  - 4. Carpet manufacturer must warrant both product and adhesive systems.
  
- B. Provide manufacturer's lifetime warranties as outlined below:
  - 1. Lifetime Face Fiber Wear
  - 2. Lifetime Staining/Soiling Resistance
  - 3. Lifetime Color Pattern Permanency
  - 4. Lifetime Delamination of Backing
  - 5. Lifetime Edge Ravel
  - 6. Lifetime Tuft Bind
  - 7. Lifetime Floor Compatibility
  - 8. Lifetime Antistatic
  - 9. Lifetime Flammability
  - 10. Lifetime Cushion Resiliency
  - 11. Lifetime Dimensional Stability
  - 12. Lifetime Floor Release
  - 13. Lifetime Moisture Resistance.
  
- C. Carpet Contractor to provide owner a written warranty that guarantees the completed installation is free from defects in materials and workmanship for a period of two (2) years after job completion.

### **1.14 EXTRA MATERIALS**

- A. Provide three (3) percent overage of calculated yardage for each type of carpet; include carpet needed for complete installation plus waste and usable scraps in calculated yardage.
- B. Recycle waste, unusable scrap and any modular carpet damaged during installation through a qualified industry recycling or manufacturer environmental program.
- C. Deliver specified attic stock requirements to Owner's designated storage space, properly packaged and identified. Retrieve a signed delivery ticket to confirm product has been provided to Owner. Include copy to Owner's representative and in closeout manual.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As a basis of design, products specified include, Milliken & Company. Web Site: [www.milliken.com](http://www.milliken.com), or approved equal.
  - 1. Product Representative: Jenn Camp – Cell: 551.500.1464; [jenn.camp@milliken.com](mailto:jenn.camp@milliken.com)
  
- B. Equivalent and Substitutions:
  - 1. Comply with substitutions as specified in Division 01.
  - 2. Must have choice of at least a minimum of 10 running line products.

### **2.2 MODULAR CARPET TILE CONSTRUCTION**

- A. Manufacturer: Milliken or approved equal
- B. Product:
  - 1. Construction: Tufted, Textured Loop



2. Fiber Content: 100% nylon Type 6 or 6,6
  3. Dye Method: Digital or Solution dyed technology
  4. Color and Pattern: Selected by Architect and approved by Owner.
  5. Pile Density: 5400 minimums.
  6. Gauge: 1/12" minimum.
  7. Surface Pile Weight: 15 oz./sq. yd. minimum.
  8. Stitches per Inch: 8.00" minimum.
  9. Backing System: Manufacturer's standard PVC-Free open cell polyurethane cushion backing
  10. Critical Radiant Flux Classification: Not less than 0.45 W/sq.cm.
  11. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165, per AATCC-165.
  12. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC-16.
  13. Stain Resistance: AATCC-175, must pass Acid Red 40 spot test with an 8 or better.
  14. TARR Rating: Severe Traffic End-Use Applications
  15. Dimensional Stability: Aachen Method Din 54318, 0.2% or less per ISO 2551.
  16. Smoke Density: < or = 450 flaming.
  17. Static Generation: AATCC 134 w/neolite < or = 3.5KV at 20% r.h.
  18. Flame-Spread and Flammability:
    - i. Carpet flammability shall meet federal Flammability Standards CPSC FF 1-70, when tested in accordance with ASTM D2959-70T (Methenamine Pill Test).
  19. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement based formulation provided by carpet tile manufacturer.12
  20. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and recommended by carpet tile manufacturer for releasable installations.
  21. Indoor Air Quality Control: Carpet tile and adhesive shall be CRI Green Label Plus certified by published class (product type) and certification number.
  22. Water intake for Manufacturing and Finishing purposes must not exceed 1 gallon per square meter.
- B. All yarn and other carpet materials shall be manufacturer's first quality.
1. Warranties: Lifetime Limited Modular Warranty
- C. Color Selection: Final Selection by Architect from Full Range of Colors, Textures, and Patterns.

### **2.3 ENVIRONMENTAL ATTRIBUTES AND CRITERIA**

- A. Environmental claims by manufacturer must comply with FTC guidelines.
- B. Low Emitting Materials – Modular Carpet. Carpet must pass the Carpet and Rug Institute Green Label Plus Program for VOC emissions.
- C. Low Emitting Materials: Modular Carpet and all installation components including adhesives, sealers, seam welds and seam sealers must meet the *Low Emitting Materials* standards as outlined in U.S. Green Building Council LEED criteria. Adhesives must meet VOC emissions standards per South Coast Air Quality Management District Rule #1168.
- D. Installation adhesives must pass the CRI Green Label plus equivalent protocol for VOC emissions.
- E. End of Life Reclamation – Carpet manufacturers must have existing program in place to achieve landfill diversion for reclamation of material.
- F. Recycled Content: Carpet must contain 35% pre-consumer recycled content based on total product weight.
- G. Carpet Face Yarn: In accordance with Executive Order 13101, carpet face yarn must contain minimum 25% pre-consumer Recycled content.
- H. NSF/ANSI 140 – 2007e Platinum Certified

### **2.4 ACCESSORIES**

- A. Leveling Compound: Latex type as recommended by carpet manufacturer; compatible with carpet adhesive and curling/sealing compound used on concrete.
- B. Multipurpose Adhesive: Manufacturer's Low VOC modular adhesive or adhesive, as recommended by carpet manufacturer for direct glue down of modular tiles; comply with CRI Green Label Certification Program.
- C. Non-Metallic Carpet edge Guard: Extruded or molded heavy-duty vinyl or rubber carpet edge guard of size and profile indicated; minimum two (2) inch wide anchorage flange; colors selected by Architect from manufacturer's standard range of colors.
- D. Miscellaneous Materials: As recommended by manufacturer of carpet, cushion, and other carpet products: as required to complete installation.
- E. Adhesive shall be manufacturer approved.
- F. Subfloor filler: Ardex feather finish or approved equal portland cement-based floor-patching compound.
- G. Cove base and Transition Strips: as selected by Architect

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which products of this section are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractors in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Examine substrates for conditions under which modular carpet tiles are to be installed.
- D. Verify that floor surfaces are smooth and flat within tolerances specified and are ready to receive work.
- E. Beginning of installation means installer accepts existing substrate conditions.

#### **3.2 PREPARATION**

- A. Allow new concrete to cure for 90 days before carpet installation starts.
- B. Perform moisture content testing as required by manufacturer's instructions to ensure pH readings of no more than nine (9). Moisture transmission of 3.0-lbs/sq. ft per 24 hours is acceptable. If values exceed this level, follow manufacturer's recommendations for moisture transmission mitigation. Do not proceed until unsatisfactory conditions have been corrected to comply with manufacturer's warranty requirements.
- C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes and other defects with sub-floor filler.
- D. Fill, level, and make smooth cracks 1/16 inch or more, holes, unevenness, and roughness with compatible latex floor patching compounds. Feather floor filling or leveling compound a minimum of four (4) ft. Sweep floor of loose granular debris prior to filling. After filling, allow filler to dry. Damp mop floor with warm water and allow to dry. Vacuum after mopping to ensure that loose granular debris is removed and to provide a proper substrate to install modular carpet. Prohibit traffic until filler is cured.
- E. Vacuum floor again immediately before installation of carpeting.
- F. Confirm compatibility of manufacturer's premium releasable carpet tile adhesive with curing compounds on concrete floors.
- G. Preheat areas to receive modular carpet to a minimum temperature of 68° F for 72 hours prior to installation, with a relative humidity of not more than 65 percent. Maintain minimum temperature of

50° F thereafter. Modular carpet and adhesive must be stored at a minimum temperature of 68° F, for 72 hours prior to installation.

- H. Store manufacturer's premium releasable carpet tile adhesive and other liquid materials in same atmospheric conditions as carpet, 68° F for at least 72 hours.

### **3.3 INSTALLATION**

- A. Install modular carpet in accordance with the Technical Bulletins provided by the manufacturer. These technical bulletins will offer the proper instructions to install modular carpet including:
  - 1. Conducting site testing and conditioning.
  - 2. Floor preparation.
  - 3. Installation of the modular carpet, including modular carpet layout (if more than one pattern or color) and approved adhesives, systems, etc. Obtain supplemental installation support from CRI 104, section 08 for your installation.
- B. Install modular carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets in each space.
- C. Conceal cut edges with protective edge guards or flanges.
- D. Install modular carpet under open-bottom items and cut tiles tight and scribe against walls, columns, and cabinets so that the entire floor area is covered with modular carpet. Cover over floor-type door closers.
- E. Install edging guards at openings and doors wherever modular carpet terminates, unless indicated otherwise.
- F. Perform cutting in accordance with manufacturer's recommendation using tools designed for modular carpet being installed. Verify modular carpet patterns and colors before cutting to insure minimal variation between dye lots.
- G. Install modular carpet according to manufacturer's instructions. Install either monolithically, quarter turned, Ashlar, or random as selected by Architect. Installation layout and pattern will be selected by the Architect during shop drawing review.
- H. Use leveling compound where necessary. Feather floor leveling compounds minimum of 4 ft.
- I. Trim and scribe modular carpet neatly at walls, and around interruptions.
- J. Complete installation of edge strips, concealing exposed edges.
- K. Cut and scribe modular carpet at fixtures, architectural elements, and perimeters.
- L. Install carpet using acceptable adhesive. Furnish and use compatible edge strip, threshold products, transition material, and nosing products as required. Color selected by Architect.

### **3.4 FIELD QUALITY CONTROL**

- A. Inspect completed modular carpet installation on each floor
- B. Verify that installation is complete; work is properly done and acceptable
- C. Remove and replace, at no additional cost to owner, any work found not to be acceptable.

### **3.5 CLEANING**

- A. On completion of installation in each area, remove dirt and scraps from surface of finished modular carpet. Clean soiling, spots, or excess adhesive on carpet with cleaning materials recommended by carpet manufacturer.
- B. Remove debris; sort pieces from carpet scraps.
- C. At completion of work, vacuum carpet using commercial vacuuming equipment as recommended by manufacturer. Remove spots and replace modular carpet where spots cannot be removed. Remove rejected modular carpet pieces and replace with new modules. Remove any protruding yarns with shears or sharp scissors.
- D. Dispose of all waste legally.
- E. Comply with waste management and recycling program requirements.

### 3.6 PROTECTION

- A. Do not permit traffic over unprotected carpet surface.
- B. Protect modular carpet against damage during construction. Cover with 6-mil thick polyethylene during construction period so that carpet will be without soiling, deterioration, wear, or damage at time of completion.
- C. Prior to furniture move in, heavy traffic areas will be protected with additional masonite sheets to protect the carpet from damage
- D. Damaged modular carpet will be rejected, replace all damaged product. As modular carpet is installed, remove trimmings, scraps of carpet and installation materials.
- E. Maintain protection of carpeting on each floor or area until work is accepted.
- F. Removal all carpet protection upon acceptance and substantial completion.

### 3.7 CARPET RECLAMATION –CARPET

- A. This specification is for carpet reclamation and is designed to manage carpet recycling for any type of used carpet or carpet pad. The intent of this specification is to recycle carpet waste from the new installations and demolition material from the existing building.
- B. Carpet Removal – Broadloom
  - 1. Remove used carpet in carpet pieces, roll tightly, and pack neatly in container. (Include carpet scrap and waste from new installation.) Immediately remove used carpet from Site. For reclamation projects coordinated by manufacturer’s reclamation department, place in manufacturer’s provided covered containers.
  - 2. Deposit only clean, dry used carpets in containers. Clean shall be defined as carpet free from demotion debris or asbestos contamination, garbage, and tack strips.
- C. Carpet Removal – Carpet Tile
  - 1. Remove used carpet tile and stack neatly on pallets. Neatly stack carpet tiles or repack in cardboard boxes prior to placing in container. Do not stack higher than 6 feet on pallets. (Include carpet scrap and waste from new installation.) Immediately remove used carpet from Site. For reclamation projects coordinated by manufacturer’s reclamation department, place in manufacturer’s provided covered containers.
  - 2. Deposit only clean, dry used carpets in containers. Clean shall be defined as carpet free from demotion debris or asbestos contamination, garbage, and tack strips.
- D. Container Handling
  - 1. Place used carpet in container. Containers are fully enclosed and shall be kept locked or supervised.
  - 2. Broadloom carpet must be segregated in separate containers from tile carpeting.
  - 3. Use effective packing techniques to maximize the amount of material in the container suitable for reclamation.
- E. Container Removal
  - 1. When container is full, contact manufacturer’s reclamation department to coordinate pickup and drop-off of replacement container if needed. If container is locked for security purposes, remove the lock prior to pick up.
- F. Reclamation Certificate
  - 1. Obtain reclamation certificate once used carpet is removed from the job site and or dealer location and delivered to reclamation facility.

END OF SECTION - 096813

## **SECTION 096900 - ACCESS FLOORING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes but is not limited to the following:
  - 1. Access floor panels, floor coverings, understructure and various electrical, data and communication accessories.
  - 2. Ramp, railing, guardrail, handrails, and accessory systems.

#### **1.2 RELATED SECTIONS**

- A. Division 01 – Specifications
- B. Division 03 – Concrete
- C. Division 03 – Concrete Sealer - Concrete sealer shall be compatible with pedestal adhesive.
- D. Division 26 - Grounding and Bonding for Electrical Systems – Coordinate connection to ground of access flooring understructure. Ground the access flooring system. The electrical contractor shall provide the necessary labor and materials to electrically connect the access flooring to the building ground as required.

#### **1.3 ENVIRONMENTAL CONDITIONS FOR STORAGE AND INSTALLATION**

- A. Area to receive and store access floor materials shall be enclosed and maintained at ambient temperatures between 35° to 95° F and relative humidity levels between 20 to 80%.
- B. All floor panels shall be stored at ambient temperatures between 50° to 90°F for at least 24 hours before installation begins.
- C. All areas of installation shall be enclosed and maintained at ambient temperature between 50° to 90°F and at relative humidity levels between 20% to 80% and shall remain within these environmental limits throughout occupancy.

#### **1.4 REFERENCES**

- A. CISCA (Ceilings & Interior Systems Construction Association) - “Recommended Test Procedures for Access Floors” shall be used as a guideline when presenting load performance product information.

#### **1.5 PERFORMANCE REQUIREMENTS**

- A. Performance Certification: Product tests shall be witnessed and certified by independent engineering and testing laboratory based in the U.S. with a minimum of (5) five years of experience testing access floor components in accordance CISCA “Recommended Test Procedures for Access Floors”.
- B. Product Sourcing: Access floor materials shall comply with the provisions outlined in FAR Subpart 25.2 – Buy American Act – Construction Materials. Products shall be provided from a single source. Floor panels shall be permanently marked with manufacturer’s name, product identification, manufacturing date and country-of-origin. Removable Product ID stickers are not acceptable.
- C. Design Load: Panel supported on actual understructure system capable of supporting a point load of 1250 lbs. applied on a one square inch area at any location on the panel without experiencing permanent set (as defined by CISCA) exceeding 0.010 inch. The loading method used to determine design (allowable) load shall be in conformance with CISCA Concentrated Load test method but with panel tested on actual understructure instead of steel blocks.
- D. Safety Factor: Panel supported on actual understructure system capable of withstanding a point load of no less than (2) two times the design load rating on a one square inch area anywhere on the panel without failure when tested in accordance with CISCA A/F, Section 2 “Ultimate Loading”. Failure is defined as the point at which the system will no longer accept the load.

- E. Ultimate Load: Panel supported on actual understructure system capable of supporting a point load of at least 2500 lbs. on a one square inch area at any location on the panel without failure (i.e. minimum safety factor of 2) when tested in accordance with CISCA A/F, Section 2, "Ultimate Loading".
- F. Rolling Load: Panel supported on actual understructure system shall be able to withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inch when tested in accordance with CISCA A/F, Section 3, "Rolling Loads". Note: Wheel 1 and 2 tests are performed on separate panels.  
CISCA Wheel 1: (3" dia x 1 13/16" wide): 1125 lbs. Passes: 10  
CISCA Wheel 2: (6" dia x 2" wide): 875 lbs. Passes: 10,000
- G. Impact Load: Panel supported on actual understructure system capable of supporting an impact load of 150 lbs. dropped from a height of 36 inches onto a one square inch area at any location on the panel when tested in accordance with CISCA A/F Section 8, "Drop Impact Load Test".
- H. Panel Drop Test: Panel to be capable of being dropped face up onto a concrete slab from a height of 36", after which it shall continue to meet all load performance requirements as previously defined.
- I. Panel Cutout: Panel with an 8" diameter interior cutout supported on actual understructure capable of maintaining its design load strength with a minimum safety factor of (2) anywhere on the panel without the use of additional supports.
- J. Flammability: System shall meet Class A Flame spread requirements for flame spread and smoke development. Tests shall be performed in accordance with ASTM-E84-1998, Standard Test Method for Surface Burning Characteristics for Building Materials.
- K. Combustibility: All components of the access floor system shall qualify as noncombustible by demonstrating compliance with requirements of ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
- L. Recycled Content: Panel and understructure system shall be required to have a minimum post-consumer recycled content of 18% and a minimum total recycled content of 49%
- M. Pedestal Axial Load: Pedestal support assembly to provide a minimum 6000 lb. axial load without permanent deformation when tested in accordance with CISCA A/F, Section 5, "Pedestal Axial Load Test".
- N. Pedestal Overturning Moment: Pedestal support assembly to provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA A/F, Section 6, "Pedestal Overturning Moment Test".

## **1.6 DESIGN REQUIREMENTS**

- A. Access floor system: where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels fastened onto, and supported by, adjustable height pedestal assemblies. Pedestal head and panel corner design must provide a positive location and lateral engagement of the panel to the understructure support system without the use of fasteners.
- B. Panel shall be easily removed by one person with a suction cup lifting device and shall be interchangeable except where cut for special conditions.
- C. Quantities: finished floor heights (FFH) and location of accessories shall be as specified on the contract drawings.

## **1.7 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
- C. Shop Drawings:

1. Detail sheets, for each proposed product type, which provide the necessary information to describe the product and its performance.
  2. Test reports, certified by an independent testing laboratory with a minimum of (5) five years of experience testing access floor components in accordance CISCA Recommended Test Procedures, certifying that component parts perform as specified.
  3. Manufacturer's installation instructions and guidelines.
  4. Manufacturer's Owner Manual outlining recommended care and maintenance procedures.
  5. Provide a layout drawing indication proposed phase configuration, post layout, panel layout, and proposed penetrations. Drawings shall show dimensions and reference starting point.
  6. Provide a coordinated shop drawing showing coordination with all systems being installed below the raised floor, and in raised floor system including grilles, diffusers, and outlets.
- D. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:
1. Recycled content – documentation showing product supports pre and post - consumer content.
  2. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
  3. Proposed products are to be manufactured within a 500-mile radius of the project site. To promote locally produced material which supports regional materials and resources where possible.
  4. Comply with recycling program and waste management procedures.
  5. Comply with optimizing energy performance.
- E. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
1. Requirements of Division 01 - CLOSEOUT PROCEDURES;
  2. Submission of maintenance instructions described in Division – 01 OPERATION AND MAINTENANCE DATA;
  3. Record documents as described in Division 01 - PROJECT RECORD DOCUMENTS;
  4. Demonstration and training requirements indicated in Division 01 - DEMONSTRATION AND TRAINING.

## **1.8 QUALITY ASSURANCE**

- A. Access floor materials shall comply with the provisions outlined in FAR Subpart 25.2 – Buy American Act – Construction Materials.
- B. Floor panels shall be permanently marked with manufacturer's name, product identification, manufacturing date and country-of-origin. Removable Product ID stickers are not acceptable.
- C. Products, components, and accessories shall be from a single source.
- D. System shall be installed by a certified manufacturer installer with a minimum of five (5) years of experience. Submit certification.
- E. Access floor manufacture shall be ISO9001:2000 certified demonstrating it has a robust and well documented quality management system with continual improvement goals and strategies.
- F. Access floor manufacturer's facilities shall be ISO14001:2004 certified demonstrating that they maintain an environmental management system.
- G. Access floor manufacturer's facilities shall be OHSAS 18001:2007 certified demonstrating that they maintain an Occupational Health and Safety Management system.
- H. Floor system and accessories shall be installed under the supervision of the manufacturer's authorized representative and according to manufacturer's recommendations. Installers shall be manufacturer trained as noted above.

## **1.9 WARRANTY**

- A. Manufacturer's Warranty - Submit manufacturer's standard (2) year warranty minimum from the date of substantial completion covering at least following items:
1. Floor finish is warranted by the manufacturer for wear and performance of the finish material in Division 09.
  2. Corrosion of all metal parts.
  3. Sagging, creasing, or breaking of panels and components.
  4. Operating mechanism to perform smoothly, without slippage or jams.
  5. Finish of all components to match in color, to be uniform, and not fade or discolor.
  6. Defects of materials and workmanship in installation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As a basis of design, the following has been specified:
1. Access floor system shall be as manufactured by Tate Access Floors, Inc. and shall consist of the ConCore 1250 access floor panel supported by PosiLock understructure system; or approved equal.
  2. Alternative products shall meet or exceed all requirements specified.
  3. Submit documents in accordance with Division 01 requirements for a compliance review.

### **2.2 SUPPORT COMPONENTS**

- A. Pedestals:
1. Pedestal assemblies shall be corrosive resistant, all steel welded construction, and provide an adjustment range of +/- 1" for finished floor heights 6" or greater.
  2. Pedestal assemblies shall provide a means of leveling and locking the assembly at a selected height, which requires deliberate action to change height setting and prevents vibration displacement.
  3. Pedestal head shall be designed with locating tabs and integral shape to interface with the panel for positive lateral retention and positioning without fasteners. Note: This allows the floor to be installed during the construction process without screws so that access by other related trades can be accomplished quickly and easily. It also enables the user to have a mixed installation of fastened and unfastened panels within the same installation.
  4. Hot dip galvanized steel pedestal head shall be welded to a threaded rod which includes a specially designed adjusting nut. The nut shall provide location lugs to engage the pedestal base assembly, such that deliberate action is required to change the height setting.
  5. Threaded rod shall provide a specially designed anti-rotation device, such that when the head assembly is engaged in the base assembly, the head cannot freely rotate (for FFH of 6" or greater). Note: This prevents the assembly from inadvertently losing its leveling adjustment when panels are removed from the installation during use.
  6. Hot dip galvanized pedestal base assembly shall consist of a formed steel plate with no less than 16 inches of bearing area, welded to a 7/8" square steel tube and shall be designed to engage the head assembly.

### **2.3 PANEL COMPONENTS**

- A. Floor Panels:
1. Panels shall consist of a top steel sheet welded to a formed steel bottom pan filled internally with a lightweight cementitious material. Mechanical or adhesive methods for attachment of the steel top and bottom sheets are unacceptable.



2. Cementitious fill material shall be totally encased within the steel welded shell except where cut for special conditions. Note: This greatly reduces the potential for dust in the environment from exposed cement materials.
3. Panel shall have an electrically conductive epoxy paint finish.
4. Corner of panel shall have a locating tab and integral shape design to interface with the pedestal head for positive lateral retention and positioning with or without fasteners.
5. Fastening of panels to pedestal heads shall be accomplished by a machine screw which is specially designed to be self capturing within the body of the panel. Note: This prevents the inadvertent loss of panel fastening screws when accessing the underfloor space and potential damage to objects by screws which extend beyond the depth of the panel.
6. Top surface of the panel shall have an option for four positioning location holes to engage positioning buttons on the PosiTile® carpet tile for precise matching of the carpet tile to the panel.
7. Fit between the pedestal head, panel, and screw shall enable an installation with an average panel to panel gap of 0.015”.
8. Tile size: 24 x 24, metal frames, concrete filled tile.

## **2.4 ACCESSORIES**

- A. Provide (10) Ten spare floor panels and (40) Forty square feet of understructure systems for each type used in the project for maintenance stock. Deliver to project in manufacturer’s standard packaging clearly marked with the contents.
- B. Provide (2) Two panel lifting devices.
- C. Provide manufacturer’s standard steps, ramps, fascia plate, perimeter support, and grommets where indicated on the contract drawings.
  1. Ramp
    - a) Provide ramp size shown on drawings.
    - b) Maximum slope: 1:12
    - c) Provide swivel head pedestals to match ramp slope.
    - d) Provide ramp threshold to mate top floor to ramp.
    - e) Provide access floor panels for sloped ramp.
    - f) Provide bolted stringers.
    - g) Provide Shoe assembly to mate bottom of ramp to lower landing.
    - h) Provide fascia plate assembly cut to match slope of ramp and to close off the end of the raised floor and lower landing.
    - i) Provide finished panel assembly including top and bottom angle trim with fasteners.
    - j) Provide all closure trims, trim angles at inside and outside corners including fasteners, rivets, accessories, and components.
  2. Railing, Handrail, and Accessories
    - a) 2-Line Guardrail at edge of ramp. To be located from the start of the ramp slope to adjacent wall.
      - (1) Space rail posts a max of 48”oc.
      - (2) Guardrail height to be a max of 42” high.
      - (3) Provide reinforcing in floor as required to provide adequate support for rail base / posts.
      - (4) Bolt rail base posts to raised floor panels. Base posts to be 4” diameter max.
      - (5) Splice pipe rail with seam connector.
      - (6) Pipe rail and posts to be a max of 1.660” OD.
      - (7) Finish as selected by Architect from full range of finish options.
    - b) Wall Mounted Handrail
      - (1) Provide wall mount brackets in the same finish as the railing. Space wall brackets a max of 60”oc. Mount bracket to wall with mechanical fasteners.

- (2) Handrail height to be a max of 34" high. Match slope of ramp and handrail.
- (3) Extend handrail a minimum of 12" overrun past the start of the ramp slope and bottom of the ramp slope in accordance with barrier free code requirements in the State where the project is located. Handrail extension to be in accordance with the local code.
- (4) Provide reinforcing of wall as required to provide adequate support for wall bracket.
- (5) Splice pipe rail with seam connector.
- (6) Pipe rail to be a max of 1.660" OD.
- (7) Railing wall returns – terminate railings ends using a radius return back to wall surface with a minimum of 6" past the wall bracket. Provide a 1/16" provide a minimum gap between the handrail and finished wall face.
- (8) Finish as selected by Architect from full range of finish options.

## **2.5 FINISHES**

- A. Finish the surface of floor panels with floor covering material as indicated on the contract drawings.

## **2.6 FABRICATION TOLERANCES**

- A. Floor panel flatness measured on a diagonal: +/- 0.035"
- B. Floor panel flatness measured along edges: +/- 0.025"
- C. Floor panel width or length of required size: +/- 0.010"
- D. Floor panel squareness tolerance: within 0.030"

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Verification of Conditions: Examine conditions under which products are to be installed in coordination with Installer of materials and components specified in this Section and notify affected General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
- C. Examine structural subfloor for unevenness, irregularities and dampness that would affect the quality and execution of the work. Do not proceed with installation until structural floor surfaces are level, clean, and dry as completed by others.
- D. Concrete sealers, if used, shall be identified and proven to be compatible with pedestal adhesive. Verify that adhesive achieves bond to slab before commencing work. Perform this task with written confirmation by sealer and adhesive manufacturers.
- E. Verify dimensions on contract drawings, including level of interfaces including abutting floor, ledges and doorsills.
- F. The General Contractor shall provide clear access, dry subfloor area free of construction debris and other trades throughout installation of access floor system.
- G. Area to receive and store access floor materials shall be enclosed and maintained at ambient temperatures between 35° to 95° F and relative humidity levels between 20 to 80%. At least 24 hrs. before installation begins, all floor panels shall be stored at ambient temperatures between 50° to 90° F and relative humidity levels between 20% to 80% and shall remain within these environmental limits throughout occupancy.
- H. Install raised floor and accessory systems in accordance with the manufacturers installation requirements.

### **3.2 INSTALLATION**

- A. Pedestal locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with pedestal installation.
- B. Installation of access floor shall be coordinated with all trades to maintain the integrity of the installed system. All traffic on access floor shall be controlled by access floor installer. No traffic but that of access floor installers shall be permitted on any floor area for 24 hours to allow the pedestal adhesive to set. Access floor panels shall not be removed by other trades for 72 hours after their installation.
- C. Floor system and accessories shall be installed under the supervision of the manufacturer's authorized representative and according to manufacturer's recommendations.
- D. No dust or debris producing operations by other trades shall be allowed in areas where access floor is being installed to ensure proper bonding of pedestals to subfloor.
- E. Access floor installer shall keep the subfloor broom clean as installation progresses.
- F. Partially complete floors shall be braced against shifting to maintain the integrity of the installed system where required.
- G. Additional pedestals as needed shall support panels where floor is disrupted by columns, walls, and perimeter cutouts.
- H. Understructure shall be aligned such that all uncut panels are interchangeable and fit snugly but do not bind when placed in alternate positions.
- I. Finished floor shall be level, not varying more than 0.062" in 10 feet or 0.125" overall.
- J. Inspect system prior to application of floor covering and replace any floor panels that are cracked, broken and structurally damaged and do not comply with specified requirements.
- K. Installed panels shall be straight and square and spaced so that the distance from one end to the other of any line of 12 panels is not less than 24 feet and does not exceed 24' 1/8".
- L. All cable and wire openings shall be sealed with manufacturer's removable cable cutout seal or grommets.

### **3.3 PROTECTION, CLEANING, DISPOSAL**

- A. After completing installation, protect flooring system from damage. Maintain protection until construction traffic has ended and Project is near Substantial Completion.
- B. Clean the underfloor slab area after installation of all under floor services and prior to floor finish installation.
- C. Clean top of Raised Floor and provide a final adjustment of panels including confirming all screws are installed to comply with all the manufacturer's requirements.
- D. Defer installation of floor finishes until Project is near Substantial Completion.
- E. Dispose of all waste legally and in accordance with local jurisdictions requirements.
- F. Clean and adjust floor in accordance with manufacturer's requirements.
- G. Completely clean and vacuum installed products.
- H. Comply with waste management and recycling program requirements.
- I. Acceptance: General contractor shall accept floor in whole or in part prior to allowing use by other trades. Floor systems shall be inspected by testing agent or certified factory representative and all corrective measures addressed by GC prior to use of system. Submit copy of inspection reports and approval to owners and architects.
- J. Final adjusting and cleaning of section.

END OF SECTION 096900

**SECTION 099100 - PAINTING (STANDARD PROFESSIONAL LINE PRODUCTS)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes, but is not limited to the following, surface preparation and field painting of exposed surfaces indicated as part of the work areas noted on the drawings.
- B. Painting and staining systems indicated on Drawings and in Schedules applied to new and existing exterior and interior surfaces and related components such as hollow metal doors frames, doors, access doors, trim pieces, etc., unless otherwise indicated, including appropriate surface preparation for all new or existing surfaces to be painted including previously painted surfaces and surfaces with existing wall coverings.

**1.2 RELATED SECTIONS:**

- A. DIVISION 04 – Masonry Restoration
- B. DIVISION 05 – Metal Fabrications
- C. DIVISION 06 – Rough Carpentry
- D. DIVISION 07 – Joints Sealants
- E. DIVISION 09 – High Performance Coatings
- F. Shop Coats: Refer to specific project manual sections for shop coats on items such as structural steel, miscellaneous metal, custom hollow metal work, and similar items.
- G. Pre-Finished Items: Refer to specific project manual sections for factory-finished, or installer-finished, items such as acoustic materials, casework, finished equipment, and similar items.
- H. Division 09 – High-Performance Coatings: For use on exterior metal surfaces and on interior where scheduled.
- I. MECHANICAL DIVISION - Heating Work: Painting related to Heating Work items.
- J. ELECTRICAL DIVISION - Electric Work: Painting related to Electric Work items.
- K. MECHANICAL DIVISION - Plumbing Work: Painting related to Plumbing Work.

**1.3 REFERENCES**

- A. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; current edition.
- B. ASTM D 523 - Standard Test Method for Specular Gloss; current edition.
- C. MPI APL - Approved Products List; Master Painters Institute; current edition.
- D. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- E. Green Seal GS-11 - Architectural Paints

**1.4 DEFINITIONS**

- A. "Paint": Coating systems including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials used as prime, intermediate, or finish coats.
- B. Conform to ASTM D 16 for interpretation of terms used in this section.
- C. Measurement of specular gloss: ASTM D 523.
- D. Dry Film Thickness (DFT): Measurement in accordance with ASTM test standard for type of coating and substrate.

**1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 – SUBMITTAL PROCEDURES.
- B. Product Data General: Submit manufacturer’s product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
- C. Product Data: For each product indicated.
  - 1. Material Schedule: Submit complete schedule of paint materials that Contractor proposes to use, including brand name of manufacturer and quality type of each material for use on project.
    - a. Architect will not entertain applicator's claims that material specified is unsuited to producing first class work unless such claim is made, in writing, with product data submittal on manufacturer’s letter head.
    - b. Obtain acceptance of materials list before ordering materials.
    - c. Architect will provide color schedule to Contractor listing paint colors selected. Architect will make color selections from color systems of accepted paint company. If materials of other manufacturers are used, colors shall match those selected.
- D. Selection Samples: For each type of finish-coat material indicated. Submit 2 sets of full range of colors available in each of proposed products, for Architect's use in preparing color selections. Prepare and deliver to Architect 2 identical sets of actual samples of each of selected colors and glosses painted on 8-1/2 inches x 11 inches x 1/4-inch thick painter’s draw down card. Wherever possible, provide samples using materials on which coating will be applied.
- E. Verification Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on gypsum board with cut edges taped, 12 x 12 inch in size.
  - 1. Submit textured coatings if required to match existing surfaces.
- F. Resubmit samples until required color, specular gloss, and texture are achieved.
- G. Quality Assurance/Control Submittals: Submit following for Project record. Architect's response is not required.
  - 1. Certification of Compliance with V.O.C. Regulations: Submit Certification by manufacturer that products supplied comply with Regulations of the state in which the project is located and other local regulations controlling use of volatile organic compounds (VOCs).
  - 2. Qualification Data: Submit Applicator's data demonstrating experience and certifying approval of manufacturer.
  - 3. Manufacturer's Instructions: Indicate special surface preparation procedures.
- H. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 01, including but limited to the following:
  - 1. Requirements of Division 01 CLOSEOUT PROCEDURES; including submission of maintenance instructions; record documents; including demonstration and training requirements.
  - 2. Coating Maintenance Manual: Upon conclusion of the project, the contractor in conjunction with the paint manufacturer or supplier shall furnish a coating maintenance manual such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal.

## **1.6 QUALITY ASSURANCE**

- A. Mockups
  - 1. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Architect shall designate a full room for sample mock-up in each phase of work. Accepted mock-up may remain as part of the Work. Comply with procedures specified in PDCA P5.
    - a. Wall Surfaces: Provide samples on at least 100 square feet.

- b. Small Areas and Items: Architect shall designate items or areas as required.
  - c. Final approval of colors will be from benchmark samples.
- B. Qualifications
- 1. Manufacturer: Minimum five (5) years of documented successful experience in manufacturing quality paint and finish materials for commercial applications.
  - 2. Applicator: Minimum five (5) years of documented successful experience in applying commercial coating systems similar to the materials specified, and minimum (3) completed commercial applications, within the last two years, of paint materials similar to specified materials in similar size applications. The Applicator shall be approved in writing by manufacturer of paint systems.
- C. Regulatory Requirements
- 1. VOC Compliance: All paint products shall comply with local jurisdiction requirements where project is located (New Jersey) for Volatile Organic Compound (VOC) content.
- D. Pre-installation Conference: Attend conference with General Contractor, paints and coatings installer, high- performance coatings system installer, and coatings manufacturers' representatives, Owner's representative.
- 1. Schedule pre-installation conference to occur immediately before or after regularly scheduled Progress Meeting.
  - 2. Verify that all parties clearly understand where materials specified in this section and in Division 09, High Performance Coatings, are to be used.
  - 3. Review other sections of these specifications in which paint primers are to be provided to ensure compatibility of total coatings system for various substrates. Request from Contractor information or characteristics of such primer materials to ensure that compatible finish coats are used.
  - 4. Advise Contractor of any known condition that will affect quality of work and which cannot be put into acceptable condition through preparatory work as included under Preparation.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver all paints, varnishes, enamels, lacquers, stains, paste fillers, and similar materials to Site in original containers, with seals unbroken and the labels intact. Provide labels with following information:
- 1. Manufacturer's name
  - 2. Type of paint (i.e., alkyd, latex, etc.) including contents by volume for major pigment and vehicle
  - 3. Brand name, lot number, brand code (if any), and color designation
  - 4. Coverage and drying time
  - 5. Surface preparation
  - 6. Clean up procedures
  - 7. Mixing and reducing instructions
  - 8. Do not bring empty containers bearing name or brand of any manufacturer upon premises for mixing of paint unless labels are cancelled, and containers are closely marked as to contents.
- B. Storage and Protection: Store all materials in single place approved by Architect. Keep storage place neat and clean. Make good all damage to it or its surroundings, occurring during its use as storage place. Remove all soiled or used rags, waste and trash from building every night and take every precaution to avoid the danger of fire.
- 1. Storage Temperature (unless otherwise recommended by paint manufacturer): Minimum 45 Degrees F. to maximum 90 Degrees F.

#### **1.8 PROJECT CONDITIONS**

- A. Environmental Conditions: Comply with following minimum temperature requirement, unless otherwise recommended by paint manufacturer. Provide continuous heating and ventilation as required to maintain surface and ambient temperatures as noted below for at least 24 hours before, during and for at least 48 hours after paint application.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 Degrees F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- C. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50- and 90-Degrees F unless otherwise indicated in writing by manufacturer.
- D. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45- and 95-Degrees F unless otherwise indicated in writing by manufacturer.
- E. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 Degrees F above the dew point; or to damp or wet surfaces.
- F. Lighting: Provide minimum 80-foot candlelight level at mid-height of substrate surface.

### **1.9 EXTRA MATERIALS**

- A. Furnish extra paint materials from the same production run as the materials applied and, in the quantities, described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
  - 1. Division 01 - Product Requirements, for additional provisions.
  - 2. Label each container with color and type in addition to manufacturer's label.
  - 3. Quantity: (5) five percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied. Store where directed.

### **1.10 WARRANTY**

- A. See Division 01 - Closeout Submittals, for additional warranty requirements.
  - 1. Provide (5) five-year manufacturer's material warranty, minimum.

## **PART 2 - PRODUCTS**

### **2.1 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
  - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
  - 2. For good flow and brushing properties.
  - 3. Capable of drying or curing free of streaks or sags.
  - 4. Color and Sheen: As selected by Architect from manufacturer's full line of standards.
- B. Product Quality: Provide products listed on MPI Approved Products List, <http://www.mpi.net/mpi/approved/index.htm>, for application indicated. Where possible, provide materials of single manufacturer. Paint material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 2. Coating Thickness: Product list below includes the manufacturers recommended minimum dry film thickness (DFT) for each product and application.

## **2.2 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Single Source Responsibility: Provide paint materials produced by single manufacturer for all surfaces indicated.
  - 1. As a basis of design products have been specified around, Sherwin-Williams Co. (Sherwin-Williams).
- C. Other Manufacturers' that are acceptable include the following:
  - 1. Benjamin Moore & Co. (Benjamin Moore).
  - 2. PPG Industries, Inc. (Pittsburgh Paints).
  - 3. MAB Paints
  - 4. Or approved equal.

## **2.3 PAINT MATERIALS, GENERAL**

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 1. Review other selections of the project manual to ensure compatibility of prime and finish coats with shop coats for other coatings specified elsewhere.
  - 2. Notify Prime Contractor and Architect in writing of any anticipated problems using painting systems indicated.
  - 3. Notify Prime Contractor and Architect in writing of any product changes or updates that may have occurred by the manufacturer.
- B. Painting Materials: Provide "best quality" grade of painting materials with identification on containers as such which have not badly settled, caked or thickened in the container and which can be readily dispersed with paddle to smooth consistency.
  - 1. Mix colors before delivering paint materials to job site, unless otherwise recommended by paint manufacturer.
  - 2. Provide thinning materials and tinting materials as recommended by paint manufacturer for products to be thinned or tinted.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- D. Colors: Provide colors as scheduled or if not scheduled as selected by Architect from manufacturer's full range of colors for each product indicated. Provide computer-matched colors for all selections made from other than specified and approved paint manufacturers.
  - 1. Accent Colors: Provide for approximately 25 percent of painting work to use accent colors. Provide one additional finish coat on all surfaces receiving accent colors. Apply accent colors where directed by Architect. Colors and locations provided during the construction phase.
- E. Conflicts: In the event of conflicts between the specification and finish schedule noted on the drawings, the item of higher cost; or quality shall govern. An RFI shall be issued to the Architect for direction / response.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**



- A. Prior to paint application, carefully examine all surfaces to be painted for defects and other conditions which cannot be corrected by surface preparation procedures indicated in this section or recommended by paint material manufacturer, and which would be detrimental to proper and timely paint application.
  - 1. Notify Prime Contractor in writing, with copies to the Owner's Representative and Architect, of any such defects and conditions, and do not proceed with painting until unsatisfactory conditions have been corrected in a manner acceptable to Applicator. Starting of paint application indicates Applicator's acceptance of surfaces and conditions within any work area.
  - 2. Defects and other conditions include, but are not limited to:
    - a. Incompatibilities of existing paint materials with new paint materials to be applied.
    - b. Deterioration of existing surfaces, including peeling of existing paint, moisture, scale, dirt, rust or similar conditions.
  - 3. Test shop-applied primer for compatibility with subsequent cover materials.
- B. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  - 1. Plaster and Gypsum Wallboard: 8 percent.
  - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

### **3.2 PREPARATION**

- A. Protection: Due to the nature of some of the existing finishes to remain and not be repainted, contractor shall endeavor to keep existing wall paint finishes designated to remain in good condition by masking off prior to start of demolition within those areas designated for same. Contractor shall protect existing walls to remain and not be painted, where called for. If the contractor cannot protect walls then they shall be responsible to repaint at their cost if they become soiled. Protect applied paint, adjacent construction, and materials at all times; by using suitable coverings. Upon completion of paint application, remove all paint and varnish spots from floors, glass and other surfaces. Remove from premises all rubbish and accumulated materials, or whatever nature not caused by others and leave work in clean, orderly and acceptable condition.
- B. Surface Preparation: Perform preparation and cleaning procedures in strict accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
  - 1. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place not to be finish painted or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for completion of painting items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items by workmen skilled in trades involved.
  - 2. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.
    - a. Clean floors adjacent surfaces, as well as surfaces to be painted, before beginning paint application.
    - b. Allow surfaces to properly dry before beginning paint application and protect from dampness.
    - c. Remove mildew and neutralize surface in accordance with paint material manufacturer's recommendations.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and re-prime.
  - 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

3. Ferrous Metals: Clean un-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 10/NACE No. 2.
    - b. Treat bare and sandblasted or pickled clean metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with some primer as the shop coat.
  4. Galvanized Surfaces: Clean galvanized surfaces with no petroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
  5. Aluminum Surfaces (scheduled for paint finish): Remove surface contamination by steam or high-pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
  6. Copper Surfaces
    - a. Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once effect is attained, rinse surfaces with clear water and allow drying.
    - b. Paint Finish: Remove contamination by steam, high-pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
  7. Gypsum Drywall: Fill all minor irregularities with spackling paste and sand to smooth, level surface. Exercise care to avoid raising nap of paper.
  8. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster, and cement board to be painted by removing all efflorescence, chalk, dust, grease, oils, and by roughening as required to remove glaze. When recommended by paint manufacturer before painting, etch concrete that is dense and smooth or that has had a hardener applied.
    - a. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- D. Paint Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in clean condition, free of foreign materials and residue.
  2. Stir material before application to produce mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  3. Use only thinners approved by paint manufacturer and only within recommended limits.

### **3.3 APPLICATION**

- A. Surfaces: If surfaces are not in proper condition for painting, repair, rebuild or refinish before proceeding with work. Be responsible for poor work caused by improper surfaces. Application of first coat does not relieve responsibility for base.
  1. Apply products in accordance with manufacturer's instructions.
  2. Factory Primed Surfaces: Finish with materials compatible with primer.
- B. Apply products in accordance with manufacturer's instructions. Secure color schedules before applying paint or finish. Tint primer and under-coater to different shade than finish coat, however, ensure that

- primer or under-coater are compatible with finish coat. Apply all materials under adequate illumination, spread evenly and flow on smoothly without runs or sags. Allow all coats to thoroughly dry before applying succeeding coats.
1. Test for compatibility of finish coats and previously applied prime coats unless compatibility is known. Test existing paint materials as required insuring compatibility with new materials.
  2. Apply materials in sufficient quantity to ensure complete coverage and hide. Provide and apply additional coats until paint film is uniform in finish, color, appearance, and coverage.
- C. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  2. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
  3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  4. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  5. Finish interior of wall and base cabinets and similar field-finished casework to match exterior unless otherwise indicated on contract documents.
- D. Sand lightly between each succeeding enamel or varnish coat.
- E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Omit primer over metal surfaces that have been shop primed and touchup painted.
  2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- F. Application Procedures: Apply paints and coatings by brush, roller, or other applicators according to manufacturer's written instructions.
- G. Minimum Coating Thickness: Apply paint materials no thinner than manufacturers recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer for each paint system used on project.
- H. Doors and Frames:
1. For metal door tops and bottoms and frame tops, finish with same number of paint coats and color as face of frames and doors.
- I. Finishing Mechanical and Electrical Work
1. Refer to Mechanical and Electrical Divisions for schedule of color coding of equipment, duct work, piping, and conduit.
  2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  3. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
  4. This DIVISION 09 includes, but is not limited to, painting of following mechanical and electrical work in spaces including mechanical and electrical rooms unless otherwise indicated in contract drawings:
    - a. Convector covers, roof top air handling unit, and fan housings, visible or exposed sheet metal ducts, visible ferrous or insulation covered pipe in finished spaces.
    - b. Fire extinguisher cabinets (not cabinet interiors), metal access doors, and grilles or registers.
    - c. Exposed electric raceways including wire mold, fittings, supports, and boxes in finished spaces.

- d. Inside of ductwork behind wall and ceiling grilles or registers.
- 5. Use materials and number of coats scheduled in this section for surfaces involved. Comply with additional requirements in Mechanical and Electrical DIVISIONS as required.
- 6. Painting of mechanical construction in mechanical rooms included in Heating, Ventilating and Air Conditioning Work and Plumbing Work as indicated in those respective DIVISIONS.
- J. Exterior Painting: Comply with the requirements of Division 09 High Performance Coating Systems work. Comply with preparation, mixing, and application instructions of paint material manufacturer for paints and substrates indicated.
- K. Block Fillers: Apply block fillers to concrete masonry units at a rate to ensure complete coverage with pores filled.
- L. Prime Coats for Unfinished Materials: Before applying finish coats, apply a prime coat, as recommended by manufacturer of finish coats, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
  - 1. For Material Which Received Shop Applied Prime Coats: Before applying finish coats, test existing prime coats to ascertain acceptable finish surface as recommended by manufacturer of finish coats. If shop applied prime coat is unacceptable to receive manufacturer's finish coat request information from manufacturer as to what material will be compatible with applied prime coat. Request acceptance from Architect prior to its use. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

### 3.4 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing, or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.5 PAINT SCHEDULE

- A. Surface Not Receiving Coating - Unless otherwise specified, do not apply coatings to following surfaces:
  - 1. Pre-finished wall panels, partitions, and ceiling tile.
  - 2. New items with undamaged factory-applied final finish.
  - 3. Concealed ducts, pipes, and conduit.
  - 4. "S" - Shop Coat: Refer to appropriate section of Project Manual. Inspect shop coat and touch up prior to finish coat application to prevent finish coat contacting bare steel. All exposed structural steel in finished areas is to be painted per schedule, unless otherwise indicated.
- B. For surfaces not listed in schedule, paint items in accordance with the manufacturers finishing requirements or the trade industry standard for that material.
- C. **Refer to High Performance Coatings for the Following items:**
  - 1. **Interior Work:** To receive high performance coatings refer to Division 09 - High Performance Coating Systems. Interior materials include but are not limited to the following:

- a. Structural Steel and Steel Joists, Galvanized Steel and Non-Ferrous Metal (Wet locations).
  2. **Exterior Work:** Exterior work items impacted by work activities shall receive high performance coatings refer to Division 09 - High Performance Coating Systems. Exterior materials include but are not limited to the following:
    - a. Exposed Structural Steel and Exposed Miscellaneous Metal
    - b. Galvanized Steel
    - c. Cast Iron material
    - d. Steel Doors and Frames in Exterior Walls - Including Glazing Frames (Ferrous)
- D. **Exterior Work:**
1. Plywood Trim - Non-Bleeding Woods / Electrical Panels
    - a. 1st Coat
      - 1) Sherwin Williams: Exterior Latex Wood Primer B42W8041
    - b. 2nd and 3rd Coats
      - 1) Sherwin Williams: A-100 Exterior Latex Satin (A82) or Gloss (A8)
- E. **Interior Work:**
1. Plywood Trim - Non-Bleeding Woods / Electrical Panels
    - a. 1st Coat
      - 1) Sherwin Williams: Exterior Latex Wood Primer B42W8041
    - b. 2nd and 3rd Coats
      - 1) Sherwin Williams: A-100 Exterior Latex Satin (A82) or Gloss (A8)
  2. Hollow Metal Doors and Frames, Including Glazing Frame
    - a. 1st Coat
      - 1) Sherwin Williams: Pro Industrial Pro-Cryl Universal WB Primer, B66-310
    - b. 2nd and 3rd Coats (SEMI-GLOSS)
      - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
  3. Exposed Miscellaneous Metals (Unless otherwise noted in High Performance Coatings)
    - a. 1st Coat
      - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
    - b. 2nd and 3rd Coats (SEMI-GLOSS)
      - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
  4. Exposed Miscellaneous Metals – Deep Tone Accent Colors (Unless otherwise noted in High Performance Coatings)
    - a. 1st Coat (Must use Tinted Primer)
      - 1) Sherwin Williams: Pro Industrial Pro-Cryl Universal WB Primer, B66-310
    - b. 2nd and 3rd Coats (SEMI-GLOSS)
      - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
  5. Exposed Galvanized Steel Deck or Existing Roof Deck
    - a. 1st Coat
      - 1) Sherwin Williams: Pro Industrial Waterborne Acrylic Dry Fall Eggshell B42 Series
    - b. 2nd and 3rd Coats (SEMI-GLOSS)
      - 1) Sherwin Williams: Pro Industrial Waterborne Acrylic Dry Fall Eggshell B42 Series
  6. Exposed Galvanized Steel Deck or Existing Roof Deck - Deep Tone Accent Colors

- a. 1st Coat (Must use Tinted Primer)
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
7. Exposed Structural Steel and Joists - Deep Tone Accent Colors (Unless otherwise noted in High Performance Coatings)
- a. 1st Coat (Must use Tinted Primer)
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
8. Galvanized Metal (Unless otherwise noted in High Performance Coatings)
- a. 1st Coat
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600
9. Gypsum Drywall
- a. 1st Coat
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer, B28-2600
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Eg-shel, B20-2600
10. Gypsum Drywall – Deep Tone Accent Color
- a. 1st Coat (must use Tinted Primer, more than 2 Finish Coats may be required)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer, B28-2600
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Eg-Shel, B20-2600
11. Gypsum Drywall – Corridors, Toilets and Locker Rooms
- a. 1st Coat
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer, B28-2600
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Pro Industrial Pre-Catalyzed WB Epoxy, K45
12. Concrete Masonry
- a. 1st Coat
    - 1) Sherwin Williams: Loxon Block Surfacer, A24-200
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600
13. Concrete Masonry – Deep Tone Accent Colors
- a. 1st Coat (must use Tinted Primer, more than 2 Finish Coats may be required)
    - 1) Sherwin Williams: Loxon Block Surfacer, A24-200
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600
14. Concrete Masonry – Field areas and Deep Tone Accent Colors - Corridor
- a. 1st Coat
    - 1) Sherwin Williams: Loxon Block Surfacer, A24-200
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Pro Industrial Pre- Catalyzed WB Epoxy, K45 / K46.

15. Concrete – Not Intended for Floors
  - a. 1st Coat
    - 1) Sherwin Williams: Loxon Concrete & Masonry Primer A24W8300
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600
16. Concrete – Deep Tone Accent Colors, Not Intended for Floors
  - a. 1st Coat (must use Tinted Primer, more than 2 coats may be required)
    - 1) Sherwin Williams: Loxon Concrete & Masonry Primer A24W8300
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600
17. Pipe Covering (Unless otherwise noted in the MEP Sections)
  - a. 1st Coat
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer, B28-2600
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600
18. Pipe covering – Deep Tone Accent Colors (Unless otherwise noted in the MEP Sections)
  - a. 1st Coat (must use Tinted Primer, more than 2 coats may be required)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer, B28-2600
  - b. 2nd and 3rd Coats (SEMI-GLOSS)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex S Gloss, B31-2600.
19. Pipe Supports and Hangers (Unless otherwise noted in the MEP Sections)
  - a. 1st Coat
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
    - 2) Enamel 90-712
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Eg-shel, B20-2600
20. Aluminum
  - a. 1st Coat
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Promar 200 Zero VOC Interior Latex Eg-Shel, B20-2600
21. Steel Piping (Unless otherwise noted in the MEP Sections)
  - a. 1st Coat
    - 1) Sherwin Williams: Pro Industrial Pro Cryl Universal WB Primer, B66-310
  - b. 2nd and 3rd Coats (EGGSHELL)
    - 1) Sherwin Williams: Pro Industrial HP Acrylic, B66-600

END OF SECTION - 099100

**SECTION 099600 – HIGH PERFORMANCE COATINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes, but is not limited to the following:
1. High performance coatings.
  2. Special preparation of surfaces.
  3. Paint metal fabrications exposed to weather or imbedded in concrete or masonry.
  4. Paint all surfaces specifically included to receive special coating system. Includes, but is not limited to:
    - a. Exterior hollow metal door and frame units, including interior face surfaces.
    - b. Exterior Structural steel beams and columns, and other surfaces required to be coated on exterior of building.
    - c. Exterior metal fabrications, not pre-finished. Includes steel bollards, exposed structural steel members, exterior railings not pre-finished, etc.
    - d. All exterior surfaces specifically included to receive painted finish (high-performance coating system).
    - e. Exposed interior and exterior mechanical piping color coding and stencil painting.
    - f. Exposed exterior mechanical equipment and ductwork painting.
    - g. Interior stair tower metal members, metal handrails and balusters.
    - h. Interior handrails and guardrails not pre-finished.
    - i. Exposed steel pipe guards and steel column corner guards in project areas.
    - j. Exterior metal panels.
    - k. Aluminum with anodized or baked-on finish.
  5. Exclusions: In addition to material obviously not requiring special coating systems such as stainless steel, plastic laminate, glass, flooring, tile, etc. Do not finish:
    - a. Surfaces indicated by finish schedule to remain unfinished.
    - b. Factory finished surfaces indicated to be factory finished.
    - c. Finish hardware, except hardware with USP finish.
    - d. Electrical devices, fixtures, and trim except as noted herein.
    - e. Equipment such as mechanical, and electrical equipment located inside equipment rooms.
    - f. Concealed ducts and piping.
- B. Related Sections:
1. DIVISION 04 - Unit Masonry
  2. DIVISION 05 - Miscellaneous Metal
  3. DIVISION 07 - Sheet Metal and Flashing
  4. DIVISIPN 07 - Roofing Systems and Accessories
  5. Mechanical and Electrical: Exterior equipment, supports and hangers for Mechanical and Electrical equipment.
  6. MECHANICAL DIVISION - Heating Work: HP Painting related to Heating Work items.
  7. ELECTRICAL DIVISION - Electric Work: HP Painting related to Electric Work items.
  8. MECHANICAL DIVISION - Plumbing Work: HP Painting related to Plumbing Work.

**1.2 REFERENCES**

- A. Reference Standards: See Division 01. Comply with following:
1. ASTM D 16 - Standard Terminology for Paint, Coatings, Materials, and Applications; current edition.



2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.
3. ASTM C 3359 - Standard Test Methods for Measuring Adhesion by Tape Test; current edition.
4. FS TT-C-535 - Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry; Federal Specifications and Standards; current edition.
5. FS TT-C-542 - Coating, Polyurethane, Oil-Free, Moisture Curing; Federal Specifications and Standards; Revision E, current edition.
6. FS TT-C-555 - Coating, Textured (For Interior and Exterior Masonry Surfaces); Federal Specifications and Standards; current edition.
7. FS TT-E-496 - Enamel: Heat-Resisting (400 degrees F.), Black; Federal Specifications and Standards; current edition.
8. FS TT-P-28 - Paint, Aluminum, Heat Resisting (1200 degrees F.); Federal Specifications and Standards; current edition.
9. GSA CID A-A-3120 - Paint: for Swimming Pools; Federal Specifications and Standards; current edition.
10. GSA CID A-A-3054 - Paint: Heat Resisting (204 deg C); Federal Specifications and Standards; current edition.
11. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; current edition.
12. SSPC-SP 1 - Solvent Cleaning; 1982 (Part of Steel Structures Painting Manual, Vol. Two) current edition.
13. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; current edition.
14. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; current edition.
15. SSPC-SP 5 - White Metal Blast Cleaning; Society for Protective Coatings; current edition.
16. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings; current edition.
17. SSPC-SP 7 - Brush-Off Blast Cleaning; Society for Protective Coatings; current edition.
18. SSPC-SP 10 - Near-White Blast Cleaning; Society for Protective Coatings; current edition.
19. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; Society for Protective Coatings; current edition.
20. SSPC-Paint 16 - Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint; Society for Protective Coatings; current edition.
21. SSPC-Paint 17 - Chlorinated Rubber Inhibitive Primer; Society for Protective Coatings; current edition.
22. SSPC-Paint 18 - Chlorinated Rubber Intermediate Coat Paint; Society for Protective Coatings; current edition.
23. SSPC-Paint 19 - Chlorinated Rubber Topcoat Paint; Society for Protective Coatings; current edition.

### **1.3 PERFORMANCE REQUIREMENTS**

- A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
  1. Surface Burning Characteristics: Flame spread / Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E 84.
  2. Lead Content: None

### **1.4 SYSTEM DESCRIPTION**

- A. Design Requirements
  1. Compatibility and Coordination: Provide coating materials, equipment, and accessories which are compatible with each other and with surfaces to be coated. Ensure compatibility of finish coats with prime coats, prime coats with surfaces to be painted, and equipment with materials to be applied.
  2. Review other sections of Project Manual to ensure compatibility of prime and finish coats with shop coats or other coatings specified elsewhere.

3. Notify Prime Contractor and Architect in writing of any anticipated problems using coating systems specified.

## **1.5 SUBMITTALS**

- A. Comply with requirements of DIVISION 01 - Submittals and as modified below, for all products indicated. Submit following for review:
- B. Product Data: Submit manufacturer's product specifications for each specified coating, including recommended cleaning and maintenance instructions, solids by volume, recommendations for mixing, thinning, and curing, and manufacturer's Material Safety Data Sheets.
- C. Color Charts: In duplicate, for all special coatings. Submit additional color charts to Owner at end of project.
- D. Samples: Submit (2) sets of samples demonstrating manufacturer's full range of colors available for each specified coating for Architect color selection. Prepare and deliver (2) identical sets of samples of each selected color in 8-1/2 inches x 11 inches x 1/4-inch material. Where possible, provide samples on specified substrates.
- E. Material List: Immediately after award of contract submit letter listing brand and quality of each material for use on project.
  1. Claims by applicator concerning unsuitability of any material specified or his inability to produce first class work with same will not be entertained unless such claim is made, in writing, with material list submittal. Provide an alternative material from the manufacturer, on manufacturer's letterhead, for material stated as unsuitable for purpose intended.
  2. Obtain acceptance of materials list before ordering materials.
- F. Special Coating System Schedule: In a form closely resembling the one herein outlining type of special coating to be used for each category, its application and color. Colors shall be as shown, scheduled and approved by Owner and Architect.
- G. Quality Control Submittals:
  1. Certificates: Submit manufacturer's certified test reports indicating results of testing in accordance with performance requirements specified in Part 2 below.
  2. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable) indicating compliance with applicable "Qualifications" requirements specified.
  3. Installer Experience Listing: Submit list of completed projects using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.
  4. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
  5. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
    - a. Certify that all coating materials conform to all current State and Federal air pollution emission laws.
    - b. Certify that all coating materials conform to all current Federal Regulations relating to hazardous materials content.
- H. Contract Closeout Submittals: Comply with requirements of Division 01 Sections including submission of maintenance instructions as item described in these sections.
  1. Maintenance Data: Include cleaning procedures and repair and patching techniques.

## **1.6 QUALITY ASSURANCE**

- A. Qualifications

1. Manufacturer: Minimum ten (10) years experience in manufacturing quality coatings for commercial applications.
  2. Applicator Qualifications: Minimum ten (10) years experience in applying coating systems similar-to those specified for commercial applications and approved in writing by coating manufacturer. Provide a listing of minimum five (5) completed commercial applications of coating materials similar-to specified materials in similar applications.
- B. Pre-Installation Conference: At least 45 days prior to scheduled start of Painting -conduct Pre-Installation Conference as required by Architect; do not begin Painting prior to this conference.
1. Attendance - Include representatives from at least following organizations:
    - a. Prime Construction Contractor and High-Performance Coating Contractor
    - b. Coating Manufacturer's technical representative
    - c. Owner
    - d. Project Representative
    - e. Architect
  2. Schedule pre-installation conference to occur immediately before or after regularly scheduled Progress Meeting.
  3. Review other sections of these specifications in which paint primers are to be provided to ensure compatibility of total coatings system for various substrates. Contractor to provide schedule indicating product information or characteristics of such primer materials to ensure that compatible finish coats are used.
  4. Review any known condition that will affect quality of work and which cannot be put into acceptable condition through preparatory work as included under Preparation.
  5. Agenda - Include at least following items on conference agenda:
    - a. Review of all systems and materials to be used in Coatings installation.
    - b. Review and coordination of all substrate preparation and related construction.
    - c. Review and modification of Coating System Installer's proposed sequencing of installation.
- C. Regulatory Requirements:
1. VOC Compliance: Provide coating products complying with local jurisdiction (New Jersey) requirements for Volatile Organic Compound (VOC) and Ozone Transport Commission (OTC) regulations, current edition.

## **1.7 MOCK-UP**

- A. Provide mock-up of coating on metal railings and steel members a minimum of, 8 feet long by 4 feet wide, illustrating coating, color, and surface sheen, for each specified coating.
1. Provide mock-up of hollow metal door and frame and steel members, 8 feet long, illustrating coating, color, and surface sheen, for each specified coating.
  2. Items Less than Width Stated Above: Paint all exposed faces.
  3. Locate where directed.
  4. Mock-up may remain as part of the Work.
  5. Accepted mock-up constitutes standard for entire special coating application.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Deliver coating materials in original containers with seals unbroken and labels intact with following information:
1. Manufacturer's Name.
  2. Type of Coating Including Contents by Volume for Major Pigment and Vehicle.
  3. Brand Name, Lot Number, Brand Code (if any), and Color Designation.
  4. Coverage and Drying Time.

5. Surface Preparation.
6. Clean-Up Procedures.
7. Mixing and Reducing Instructions.

B. Storage and Protection: Store materials in single location. Coordinate storage location with Owner and Owner's representative on site. Inform Architect of agreed upon storage location at regularly scheduled job meeting. Keep storage place neat and clean and restore damage occurring during use. Remove soiled or used rags, waste, and trash from building every night, and take precautions to avoid danger of fire. Maintain minimum 45 Degrees F. to maximum 90 Degrees F. storage temperature, unless otherwise recommended by coating manufacturer.

1. Do not allow coating materials to settle, cake, or thicken in container in manner that inhibits ready dispersion with paddle to smooth consistency.

### **1.9 PROJECT/SITE CONDITIONS**

A. Existing Conditions:

1. Spaces: Clean before finishing is started. Do not finish spaces where rubbish has accumulated or while rubbish is being removed. Finishing not allowed in dusty spaces.
2. Do not remove rubbish while finish is fresh.
3. Surfaces: Dry and clean.
4. Existing Primed Ferrous Metal Surfaces: Test as described in Part 3 Article, Examination.

B. Environmental Requirements: Comply with manufacturer's recommendations.

1. Do not install materials when temperature is below 55 degrees F (13 degrees C) or above 90 degrees F (32 degrees C).
  - a. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
2. Do not apply paint when damp or rainy weather exists, is predicted or anticipated, or when surfaces show evidence of condensation.
3. Exterior painting not allowed while dust is blowing.
4. Lighting: Provide minimum lighting level of 80 ft candles measured mid-height at substrate surface.
5. Restrict traffic from area where coating is being applied or is curing.

### **1.10 WARRANTY**

A. See Division 01 – Contract Closeout, for additional warranty requirements.

1. Correct defective Work within a five (5) year period after Date of Substantial Completion.
2. Warranty: Include coverage for bond to substrate.

### **1.11 SEQUENCING**

A. Coordinate scheduling of finish coatings application to succeed installation of structural steel, and purlins. Any finished material installed prior to painting shall be properly protected.

B. Prime and finish coat surfaces of lintels that will be concealed after construction in accordance with specification requirements herein prior to erection.

### **1.12 MAINTENANCE PRODUCTS**

A. Provide 1 gallon of each color of each type of coating specified, for Owner's maintenance use.

B. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

- C. Provide listing of coatings numbers, and lot numbers for each color selected for Owner's future use.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As basis of Design, details and specifications have been based on products listed in the Coating Schedule as follows:
1. Tnemec Company, Inc., North Kansas City, Missouri: [www.tnemec.com](http://www.tnemec.com), and
  2. Sherwin Williams (S-W): [www.sherwin-williams.com](http://www.sherwin-williams.com).
    - a. Other manufacturers include:
      - 1) Carboline Company: [www.carboline.com](http://www.carboline.com).
      - 2) PPG Architectural Finishes, Inc.: [www.ppgaf.com](http://www.ppgaf.com).
      - 3) Or approved equal
  3. Substitutions: Division 01 - Equipment and Material – Product Requirements.
- B. Single Source Requirement: Provide products for each specified function and coating system by a single manufacturer.

### **2.2 MATERIALS**

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
1. Lead content: Lead free as required by regulations.
  2. Chromium content, as zinc chromate or strontium chromate: None.
  3. Maximum volatile organic compound (VOC) content: As required by applicable regulations.
  4. Colors: Selected by Architect from manufacturer's standard colors.
- B. High Performance Epoxy Coatings: Provide "best quality" grade of materials with identification on containers as such; have not badly settled, caked, or thickened in the container; can be readily dispersed with paddle to smooth consistency; and comply with following performance requirements:
1. Abrasion Resistance: (ASTM D 4060, CS-17 Wheel, 1,000 grams) - Not more than 145 mg. loss after 1,000 cycles.
  2. Chemical Resistance: (FS TT-C-550 C, Paragraph 4.4.6) - No evidence of discoloration, blistering, loss of adhesion or softening with listed solutions.
  3. Humidity: (FS TT-C-550 C, Para. 4.4.7) - No gloss change of more than 5 percent, no color difference greater than 3 MacAdam units, and no cracking, checking or other deterioration.
  4. Scrubbability: (Federal Test Method Std. - No. 141, Method 6142, 10000 cycles) - No coating removed; maximum 15 percent gloss change.
  5. Stain Resistance: (ASTM D 1308) - Unaffected by following stains after 16-hour spot test - blackberry jam, catsup, "Crisco" oil, lime juice, margarine, mustard, salad dressing, 5 percent sodium hydroxide, "Tide" solution, toothpaste, vinegar.
  6. Steam Resistance: (10-hours steam at 250 Degrees F) - Color change no greater than (3) MacAdam units, no gloss change over 5 percent, no blistering, checking, cracking or other deterioration.
  7. Adhesion: (Cross Cut Tape Test Method 5B, ASTM D 3359) -100 percent retention.
  8. Solids by Volume: 44.0 +/- 2.0 percent (mixed) - Surface Burning Characteristics (ASTM E 84) - 25 or less flame spread; 100 or less smoke development.

- C. Epoxy Coating: Two coats, epoxy, gloss finish.
1. Comply with the performance requirements of FS TT-C-535, Type II.
  2. Product: As recommended by manufacturer for substrate.
    - a. Product: Pro Industrial High-Performance Epoxy by S-W
    - b. Product: 84 HS Epoxy manufactured by Tnemec.
  3. Primers: As recommended by manufacturer for substrate.
    - a. Primer for concrete: 84 HS Epoxy, manufactured by Tnemec or approved equal.
    - b. Primer for exterior ferrous metal:
      - 1) 90-97 TnemeZinc, manufactured by Tnemec.
      - 2) Corothane I Galva-Pac Zinc Primer by S-W
      - 3) Or approved equal
    - c. Primer for non-ferrous metal:
      - 1) 27 Typoxy or N69 Hi-Build Epoxoline II, manufactured by Tnemec.
      - 2) Macropoxy 646 FC Epoxy by S-W
      - 3) Or approved equal
- D. High-Build Acrylic Coating: Two coats, water-base acrylic epoxy, satin finish.
1. Locations: Steel doors and frames.
  2. Product characteristics:
    - a. Percentage of solids by volume: 42, minimum.
    - b. Dry film thickness, per coat: 2, minimum.
    - c. Comply with the performance requirements specified above for moderate exposure.
    - d. Comply with the performance requirements of FS TT-C-535, Type II. Products include:
      - 1) 113-High Build Satin Tneme-Tufcoat manufactured by Tnemec.
      - 2) 114-High Build Gloss Tneme-Tufcoat manufactured by Tnemec.
      - 3) Pro Industrial Hi Bild WB Catalyzed Epoxy by S-W
      - 4) Or approved equal
    - e. Primers: As recommended by manufacturer for substrate.
      - 1) Primer for ferrous metal:
        - a) 27 Typoxy or 90-97 TnemeZinc, manufactured by Tnemec.
        - b) Macropoxy 646 FC Epoxy by S-W
        - c) Or approved equal
      - 2) Primer for non-ferrous metal:
        - a) 27 Typoxy or N69 Hi-Build Epoxoline II, manufactured by Tnemec.
        - b) Macropoxy 646 FC Epoxy by S-W
        - c) Or approved equal
- E. Urethane Coating: Two coats, two-part, aliphatic high-build acrylic polyurethane moisture-curing polyurethane, semi-gloss finish.
1. Product characteristics:
    - a. Percentage of solids by volume: 58, minimum.
    - b. Dry film thickness, per coat: 2, minimum.
    - c. Comply with the performance requirements specified above for moderate exposure.
    - d. Comply with the performance requirements of FS TT-C-542, Type I.
      - 1) Product: As recommended by manufacturer for substrate.
        - a) 73 manufactured by Tnemec.
        - b) Acrolon 218 HS Polyurethane by S-W
        - c) Or approved equal

- e. Primers: As recommended by manufacturer for substrate.
  - 1) Primer for concrete:
    - a) N69 Hi-Build Epoxoline II, manufactured by Tnemec.
    - b) Kem Cati-Coat HS Epoxy Filler/Sealer by S-W
    - c) Or approved equal
  - 2) Primer for ferrous metal:
    - a) 27 Typoxy or 90-97 TnemeZinc, manufactured by Tnemec.
    - b) Corothane I Galva-Pac Zinc Primer by S-W
    - c) Or approved equal
  - 3) Primer for non-ferrous metal:
    - a) 27 Typoxy or N69 Hi-Build Epoxoline II, manufactured by Tnemec.
    - b) Macropoxy 646 FC Epoxy by S-W
    - c) Or approved equal
- F. High-Build Urethane Coating: One coat, two-part, acrylic polyurethane, semi-gloss finish.
  - 1. High-Build Urethane Coating: Two coats, two-part, acrylic polyurethane, gloss finish.
  - 2. Product characteristics:
    - a. Percentage of solids by volume: 68, minimum.
    - b. Dry film thickness, per coat: 3, minimum.
    - c. Comply with the performance requirements specified above for moderate exposure.
    - d. Comply with the performance requirements of FS TT-C-542, Type I.
      - 1) As recommended by manufacturer for substrate.
        - a) 1075 manufactured by Tnemec.
        - b) Acrolon 218 HS Polyurethane by S-W
        - c) Or approved equal
  - e. Primers: As recommended by manufacturer for substrate.
    - 1) Primer for concrete:
      - a) N69 Hi-Build Epoxoline II, manufactured by Tnemec.
      - b) Kem Cati-Coat HS Epoxy Filler/Sealer by S-W
      - c) Or approved equal
  - f. Primer for ferrous metal:
    - 1) 27 Typoxy or 90-97 TnemeZinc, manufactured by Tnemec.
    - 2) Macropoxy 646 FC Epoxy by S-W
    - 3) Or approved equal
  - g. Primer for non-ferrous metal:
    - 1) 27 Typoxy or N69 Hi-Build Epoxoline II, manufactured by Tnemec.
    - 2) Macropoxy 646 FC Epoxy by S-W.
    - 3) Or approved equal
- G. Polyamide Epoxy Coating: Two coats, satin finish.
  - 1. Locations: lintels located in masonry construction.
  - 2. Rubber Coating: Two coats, chlorinated rubber, FS TT-P-95, eggshell finish.
  - 3. Product characteristics:
    - a. Percentage of solids by volume: 56, minimum.
    - b. Dry film thickness, per coat: 3, minimum.
    - c. Comply with the performance requirements specified above for moderate exposure.
    - d. Product As recommended by manufacturer for substrate.
      - 1) N69 Hi-Build Epoxoline II manufactured by Tnemec.

- 2) Macropoxy 646 FC Epoxy by S-W.
  - 3) 161 Tneme Fascure manufactured by Tnemec, as Contractor's option when fast curing is desirable.
  - 4) Or approved equal
- e. Primers: As recommended by manufacturer for substrate.
- 1) Primer for ferrous metal:
    - a) 90-97 TnemeZinc, manufactured by Tnemec.
    - b) Corothane I Galva-Pac Zinc Primer by S-W.
    - c) Or approved equal
  - 2) Primer for galvanized steel: Self-priming on non shop coated substrates.
  - 3) Primer for ferrous metal for immersion and splash zone service:
    - a) 90-97 TnemeZinc, manufactured by Tnemec.
    - b) Corothane I Galva Pac Zinc Primer (See/Consult S-W: Macropoxy 646 PW version for potable water immersion) by S-W
    - c) Or approved equal
- f. Primer for ferrous metal for atmospheric service:
- 1) 27 Typoxy or 90-97 TnemeZinc, manufactured by Tnemec.
  - 2) Macropoxy 646 FC Epoxy by S-W
  - 3) Or approved equal
- H. Moderate-Heat-Resistant Coating for Ferrous Metal: Two-coats enamel, GSA CID A-A-3054, formulated for service up to 400 degrees F (204 degrees C), black.
1. Product characteristics:
    - a. Percentage of solids by volume: 68, minimum.
    - b. Dry film thickness, per coat: 2.5, minimum.
    - c. Comply with the performance requirements specified above for moderate corrosive exposure.
    - d. Product:
      - 1) 92 Tneme-Zinc manufactured by Tnemec.
      - 2) Silverbrite HD Rust Inhibitive Paint (400F) by S-W.
      - 3) Or approved equal
- I. High-Heat-Resistant Coating for Ferrous Metal: Two-coats aluminum paint, FS TT-P-28, formulated for service up to 1200 degrees F (650 degrees C).
1. Product characteristics:
    - a. Percentage of solids by volume: 39, minimum.
    - b. Dry film thickness, per coat: 1.0, minimum.
    - c. Comply with the performance requirements specified above for moderate corrosive exposure.
    - d. Product:
      - 1) 39-1261 manufactured by Tnemec.
      - 2) Silverbrite Hi-Heat Silicone Alkyd Paint (500-1000F) by S-W.
      - 3) Or approved equal
- J. Phosphatizing Cleaner: Bio-degradable, water-reducible phosphoric acid and detergent blend: Clean n' Etch by Great Lakes Laboratories.
- K. Concrete Masonry Filler: Vehicle and resin compatible with topcoats, Portland cement and sand, formulated for application rate of 60 to 80 sq ft per gal; 130 - Enviro Fill manufactured by Tnemec.
- L. Masonry Filler: Vehicle and resin compatible with topcoats, Portland cement and sand, formulated for applied thickness of 30-40 mils;



1. 130 - Enviro Fill manufactured by Tnemec.
  2. S-W Cement Plex 875 Block Filler by S-W.
  3. Or approved equal
- M. Primers: Factory prime metal deck with Tnemec 66, 161, or N69 Hi-Build Epoxoline II or a thin epoxy coating, compatible with Tnemec Series N69 Hi-Build Epoxoline II or 161, or as recommended by coating manufacturer for specific substrate, unless otherwise specified.
- N. Primers (factory/shop) Macropoxy 646 FC Epoxy or Recoatable Epoxy Primer by S-W.
- O. Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.
- P. Shellac: Pure, white type.

### **2.3 MIXING**

- A. Mix and thin materials according to manufacturer's latest printed instructions.
1. Factory Premix Colors: Before delivering coating materials. Factory premix all colors as selected by Architect.
  2. Provide colors as selected by Architect from coating manufacturer's full range of colors for each product specified.
- B. Do not use materials beyond manufacturer's recommended shelf life, and do not use mixed materials beyond manufacturer's recommended pot life.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions by Applicator: Prior to beginning special coating application, carefully examine all surfaces to receive coatings for defects and other conditions that cannot be corrected by surface preparation procedures specified below or recommended by coating manufacturer and which would be detrimental to proper and timely completion of coating application. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates:
1. Verify that shop-applied primers are compatible substrates.
  2. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.
  3. Masonry: Verify masonry joints are struck flush.
  4. Wood: Do not begin application if substrate has moisture content over 12 percent.
  5. Defects and other conditions include, but are not limited to:
    - a. Incompatibility of existing coating materials with new coatings to be applied.
    - b. Deterioration of surfaces, including peeling of existing coating, moisture, scale, dirt, rust or similar conditions.
    - c. Ensure compatibility of specified coating with existing finish by applying coating in unobtrusive location approved by Architect.
  6. Notify Prime Contractor in writing, with copies to the Owner's Representative and Architect, of any such defects and conditions, and do not proceed with coating applications until unsatisfactory conditions have been corrected in manner acceptable to coating Applicator. Start of coating application indicates Applicator's acceptance of surfaces and conditions within any particular area.

### **3.2 PREPARATION**

- A. Protection

1. Protective Measures: Provide covers or other appropriate protection measures for adjacent surfaces during application of coatings.
  2. Fixtures: Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be coated or provide surface-applied protection prior to surface preparation and coating application. After completion of coating application, reinstall removed items using workmen skilled in trades involved.
- B. Surface Preparation: Clean surfaces of loose foreign matter.
1. Comply with coating manufacturer's surface preparation and surface treatment recommendations.
  2. Remove substances that would bleed through finished coatings. If un-removable, seal surface with shellac.
  3. Remove and neutralize mildew on surfaces to be painted by scrubbing with a trisodium phosphate type cleaner combined with sodium hypochlorite. Rinse, and allow to dry before painting.
  4. Dislodge dirt, rust, plaster, nibs, mortar spatter, and other dry material by scraping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high pressure air. Remove oil, wax and grease by scraping off heavy deposits and cleaning with mineral spirits or hot tri-sodium phosphate solution followed by water rinse. Verify that surfaces to be coated are dry, clean, and free of dust, dirt, oil, wax, grease or other contaminants.
  5. Concrete, Masonry, and Cement Stucco: Allow new concrete and masonry to cure at least 28 days. Scrape and grind fins and protrusions flush with surface. Patch holes and cracks flush with surface. Rake mortar joints clean.
  6. Plaster: Allow to cure 28 days. Remove nibs and other protrusions by scraping flush with surface. Patch voids and cracks with spackling compound to match texture of surface.
  7. Gypsum Board: Sand joint compound smooth and flush with surface using fine grit sandpaper. Fill nicks, scratches, holes and uneven spots with spackling compound and after dry, sand flush with surface.
  8. Non-Ferrous Metal: SSPC-SP1 Solvent cleaning to remove all contaminants.
  9. Ferrous Metal: Remove loose rust, mill scale and other foreign matter by hand (SSPC-SP2) or power tool (SSPC-SP3) cleaning and apply specified coating before rusting occurs.
  10. Galvanized Metal/Galvanized Deck: Remove contaminants and protective mill coating by SSPC-SP1 Solvent Cleaning or steam cleaning.
  11. Wood: Remove surface deposits of sap and pitch by scraping and cleaning with mineral spirits. Seal knots and pitch pockets with coating manufacturer's recommended products. Sand rough spots of smooth siding and finish woodwork. After prime coat is dry, fill cracks, holes and scratches with suitable wood filler or spackling compound and when dry, sand flush with surface. Sand lightly between coats.
  12. Concrete Floors: Prepare by acid etching, whip blasting or mechanical shot blasting as recommended by coating manufacturer.
    - a. Patching and Repair of Existing Concrete Floors: Patch and repair existing floor substrate as required to provide smooth, level surface acceptable to receive new floor coating materials.
      - 1) Applicator Qualifications: Ensure patching and repair materials are applied by applicator experienced in application of patching and repair materials and with at least (3) successfully completed applications of similar materials in similar applications.
      - 2) Coordination: Ensure proposed patching and repair materials are compatible with new floor coating materials.
      - 3) Levelness Tolerances: Apply floor patching and repair materials to provide levelness of floor substrate within at least 1/4 inch in 10 feet, unless more stringent levelness recommended or required by floor coating manufacturer.
      - 4) Flash Patching: Apply flash patching material to damaged areas with 1/8 inch or less depressions.

- 5) Patching: Apply patching material to damaged areas with depressions over 1/8 inch deep.
  - 6) Self-Leveling: Apply self-leveling material to large damaged areas where flash patching and patching described above cannot provide smooth, level surface acceptable to receive new floor coating materials.
- C. Existing Painted and Sealed Surfaces:
1. Strip existing paint and coatings from surface.
  2. Remove loose, flaking, and peeling paint. Feather edge and sand smooth edges of chipped paint. Follow recommendations of coating manufacturer.
  3. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.
  4. Thoroughly clean and touch up shop applied prime coatings damaged during transportation, construction or installation. Use repair procedures which insure complete protection of adjacent primer.
    - a. Repair methods and equipment may include wire brushing, hand or power tool cleaning or dry air blast cleaning.
    - b. In order to prevent injury to surrounding painted areas, blast cleaning may necessitate use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking.
    - c. If damage is too extensive to touch-up, item shall be re-cleaned and coated or painted.

### **3.3 PRIMING**

- A. Apply primer to scheduled surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
1. Wood: Prior to priming patch with filler to produce smooth, even surface.
  2. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.
  3. Concrete Masonry Units: Apply masonry filler to thickness required to fill holes and produce smooth surface; minimum thickness of 60 to 80 sq ft per gal.
  4. Steel: Shop primed with Themec manufacturer's zinc rich primer; or with S-W manufacturer's zinc rich primer.
  5. Other Substrates: Confirm material type and obtain manufacturers written coating recommendations.

### **3.4 COATING APPLICATION**

- A. Surfaces: If surfaces are not in proper condition for painting, repair, rebuild or refinish before proceeding with work. Be responsible for poor work caused by improper surfaces. Application of first coat does not relieve responsibility for base.
1. Do not apply any coats on either damp or wet surfaces.
  2. Factory Primed Surfaces: Finish with materials compatible with primer.
- B. Mix paint to proper consistency. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified. Brush out smooth, leaving minimum of brush marks.
1. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.
  2. Allow each coat to dry thoroughly, and in conformance with manufacturer's written time recommendations, before starting application of successive coat.
  3. Sand work between coats on wood and metal.
- C. Application:

1. Roller Applied: Where paint or enamel is rolled on, use fine nap roller so nearly flat or orange-peel texture is obtained.
  2. Back prime all exposed to view wood trim members with one coat of primer. At cut ends of wood trim members provide one coat of primer, after sanding cut surfaces and prior to installation.
- D. Provide the number of coats specified; and mil-thickness are minimum values acceptable. No painted area shall be less than values given.
- E. Colors: Finish coat shall be color as selected by Architect. Tint pigmented undercoats to approximately same shade as finish coat, perceptibly increasing depth of shade in successive coats.
- F. Comply with manufacturer's recommended application instructions for coating materials and surfaces indicated. Secure color selections before applying coating. Tint primer and under-coater to different shade than finish coat, however, ensure that primer or under-coater are compatible with finish coat.
- G. Apply materials at specified film thickness by method recommended by coating manufacturer. Apply sufficient quantity to ensure complete coverage and hide. Provide and apply additional coats until coating film in uniform in finish, color, appearance, and coverage.
1. Apply first coat to porous masonry surfaces, concrete, and dense masonry in manner to completely fill voids and surface irregularities.
  2. Allow each coat to dry thoroughly before recoating. Follow coating manufacturers recommended recoat time.
  3. Cut edges clean and sharp where coating adjoins other materials or colors.

### **3.5 ADJUSTING/CLEANING**

- A. During coating application, remove all discarded materials, rubbish, can, and rags.
- B. Touch up and restore finish where damaged. Upon completion of coating application, clean all surfaces spattered with coating materials in accordance with coating manufacturer's recommendations exercising care not to scratch or otherwise damage finished surfaces.
- C. Dispose of waste legally and in accordance with local jurisdiction requirements.

### **3.6 SCHEDULES OF COATINGS**

- A. Surface Not Receiving Coating - Unless otherwise specified, do not apply coatings to following surfaces:
  1. Face Brick
  2. Pre-finished wall panels, partitions, and ceiling tile.
  3. New items with undamaged factory-applied final finish.
  4. Concealed ducts, pipes, and conduit.
- B. High Performance Epoxy Coating Systems – General Use
  1. **INTERIOR APPLICATIONS:**
    - a. Structural Steel and Steel Joists, Galvanized Steel and Non-Ferrous Metal - Interior Applications (Exposed to view):
      - 1) 1st Coat - 2.5 to 3.5 mils DFT.
        - a) Tnemec: “Series N69-Color Hi-Build Epoxoline II”
        - b) S-W Macropoxy 646 FC Epoxy or Macropoxy 646 Epoxy
      - 2) 2nd and 3rd Coats - 2.0 to 3.0 mils DFT.
        - a) Tnemec: “Series N69-Color Hi-Build Epoxoline II”
        - b) S-W Macropoxy 646 FC Epoxy Epoxy
  2. **EXTERIOR APPLICATIONS:**
    - a. Exposed Structural Steel and Exposed Miscellaneous Metal - Exterior Applications:

- 1) 1st Coat
    - a) Tnemec: "Series 90-97 Tneme-Zinc" at 2.5 to 3.5 mils DFT.
    - b) S-W Corothane I Galva-Pac Zinc Primer
  - 2) 2nd Coat
    - a) Tnemec: "Series N69 – Color Hi-Build Epoxoline II" at 3.0 to 5.0 mils DFT
    - b) S-W Macropoxy 646 FC Epoxy
  - 3) 3rd Coat
    - a) Tnemec: "Series 1074 or 1075 – Color Endura-Shield II" at 2.0 to 5.0 mils DFT
    - b) S-W Acrolon 218 HS Polyurethane
- b. Galvanized Steel - Exterior Applications:
- 1) 1st Coat
    - a) Tnemec: "Series N69 – Color Hi-Build Epoxoline II" at 3.0 to 5.0 mils DFT
    - b) S-W Macropoxy 646 FC Epoxy
  - 2) 2nd Coat
    - a) Tnemec: "Series 1074 or 1075 – Color Endura-Shield II" at 2.0 to 5.0 mils DFT
    - b) S-W Acrolon 218 HS Polyurethane
- c. Cast Iron material – Exterior Application:
- 1) 1st Coat
    - a) Tnemec: "Series N69 – Color Hi-Build Epoxoline II" at 3.0 to 5.0 mils DFT
    - b) S-W Macropoxy 646 FC Epoxy
  - 2) 2nd Coat
    - a) Tnemec: "Series N69 – Color Hi-Build Epoxoline II" at 3.0 to 5.0 mils DFT
    - b) S-W Acrolon 218 HS Polyurethane
- d. Metal Panels and non-metallic metal surfaces (Verify existing substrate material type and adjust paint coatings as recommended by the MFR.)
- 1) 1st Coat
    - a) Tnemec: "Series 135 – Chembuild, applied at 3.0 to 5.0 mils DFT
  - 2) 2nd Coat
    - a) Tnemec: "Series 27 - Typoxy applied at 2.0 to 3.0 mils DFT
    - b) Color to slightly contrast with finish coat.
  - 3) Finish Coat
    - a) Tnemec: "Series 73 – Endura Shield, applied at 2.0 to 3.0 mils DFT
    - b) Color selected by Architect.
3. Steel Doors and Frames in Exterior Walls:
- a. General: Apply two (2) coats of finish on tops, bottoms, and edges of doors. In addition to coating entire exposed frame apply two (2) coats of finish to tops and edges of frames also.
  - b. Primer: (un-primed doors only or spot primer)
    - 1) Tnemec Series 18 -1092 Grey Enviro-Prime 2.0 to 3.0 mils DFT.
    - 2) S-W Kem Bond HS Universal Primer

- c. Finish Coats:
  - 1) Two coats Tnemec Series 113 at 4.0 to 6.0 mils DFT.
  - 2) Two coats S-W Pro Industrial Hi Bild Catalyzed Epoxy (\*)
  - 3) (\*) Note: Epoxy coatings will chalk over time with regular UV exterior exposure. A urethane finish will be considered for better color and gloss retention when suggested by paint manufacturer based on field conditions.
4. Exterior Aluminum including downspouts, gutter assemblies, and accessories (Verify existing substrate material type and adjust paint coatings as recommended by the MFR.):
  - a. General: Apply two (2) coats of finish to coating entire exposed surfaces and edges.
  - b. Primer: Prime surfaces with manufacturers recommended primer from Tnemec or approved equal for the substrate. Provide a minimum of 2.0 to 3.0 mils DFT.
  - c. Finish Coats: Apply two coats of finish paint with manufacturers recommended finish paint from Tnemec or approved equal for the substrate. Provide a minimum of 4.0 to 6.0 mils DFT.
5. Metal Doors: After doors have been fitted and are ready for final hanging, finish four edges of metal doors same as two faces. Where faces have different finishes, finish edges as directed.
6. Prime Coated Door Closers and Hardware: Paint all door closers, removable mullions and prime coated hardware as specified under ferrous, zinc coated or factory primed metal - painted.
7. Metal Door Louvers and Glass Stops: Paint as specified for zinc ferrous coated or factory primed metals -painted.
8. Metal Door and Frame Tops: Apply two (2) coats of finish on tops of doors and frames.
9. Leave hardware free of paint and in operating condition.
10. Prime Coated Hinges: Paint to match door frame to which they are attached.

END OF SECTION - 099600

## **SECTION 101400 - SIGNAGE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes but is not limited to the following:
  - 1. Interior panel signs.
  - 2. Interior sign types.
  - 3. Exterior dimensional letters.
  - 4. Sign schedule.

#### **1.3 RELATED SECTIONS**

- A. Division 01 – Specifications
- B. Division 04 – Unit Masonry
- C. Division 06 - Rough Carpentry
- D. Division 09 – Gypsum Board Assemblies
- E. Division 09 – Tiling

#### **1.4 DEFINITIONS**

- A. ADA-ADA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

#### **1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in 013300 SUBMITTALS.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required, including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign, for each product indicated.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of interior signs, including plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details. Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout. Photocopies of Design documentation not acceptable.
  - 2. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

3. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout.
- D. Samples: For each sign material indicated that involves color selection.
  1. Initial Selection: Submit samples of each color and finish of exposed materials and accessories for interior signs demonstrating manufacturer's full range of colors and finishes for selection by Architect.
  2. Verification: For each type of sign, submit full-size samples for Architect's review and verification of color and texture.
  3. Approved samples will not be returned for installation into Project.
- E. Quality Control Submittals
  1. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable) indicating compliance with applicable requirements specified below.
  2. Provide signage products from a single source.
- F. Environmental Submittals: Show evidence including but not limited to the following:
  1. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.
- G. Contract Closeout Submittals: Comply with Division 00 and 01 specifications.

## **1.6 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in IBC-NJ and NJUCC including the Building Code Barrier Free Subcode and ICC/ANSI A117.1.

## **1.7 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

## **1.8 COORDINATION**

- A. Coordinate placement of anchorage devices with templates for installing signs.

## **1.9 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Deterioration of embedded graphic image colors and sign lamination.



2. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Steel:
  1. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi (290-MPa) minimum yield strength.
  2. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Fiberglass Sheet: Molded, seamless, thermosetting, glass-fiber-reinforced polyester panels with a minimum tensile strength of 15,000 psi (103 MPa) when tested according to ASTM D 638 and with a minimum flexural strength of 30,000 psi (207 MPa) when tested according to ASTM D 790.
- C. Acrylic Sheet: See RP-3 in specification section "060660 Schedules for Plastic Fabrications"
- D. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
  1. Impact Resistance: 16 ft-lbf/in. (854 J/m) per ASTM D 256, Method A.
  2. Tensile Strength: 9000 lbf/sq. in. (62 MPa) per ASTM D 638.
  3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. (2345 MPa) per ASTM D 790.
  4. Heat Deflection: 265 deg F (129 deg C) at 264 lbf/sq. in. (1.82 MPa) per ASTM D 648.
  5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

### **2.2 PANEL SIGNS**

- 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. ASI-Modulex, Inc.
  2. Grimco, Inc.
  3. Matthews International Corporation; Bronze Division.
  4. Mills Manufacturing Company.
  5. Or approved equal
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
  1. Acrylic Sheet: RP-3
  2. Edge Condition: Square cut.
  3. Corner Condition: Rounded to radius indicated.
  4. Mounting: Unframed.
    - a. Wall mounted with two-face tape.
    - b. Manufacturer's standard anchors for substrates encountered.
  5. Custom Paint Colors: Match Pantone color matching system.
  6. Color: As selected by Architect from manufacturer's full range of standard and premium colors and textures.

7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
- C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with the Barrier Free Subcode and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
  1. Panel Material: Multi layered translucent & opaque acrylic sheets refer to RP-3 of specification 060660 Schedule for Plastic Fabrications
  2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).
- D. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.
  1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
  2. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
- E. Subsurface Copy: Apply minimum 4-mil- (0.10-mm-) thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.
- F. Colored Coatings for Acrylic Sheet: For copy and colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for years for application intended.
  1. Color: As selected by Architect from manufacturer's full range.
- G. Panel Sign Schedule: As identified on Contract drawings with supplementary information listed at the end of this specification section.

### **2.3 INTERIOR SIGN TYPES**

- A. Interior Signage Types: Not all types may be applicable for project. Refer to Signage Schedule for specific text and quantities. Adjust signage size as required for graphic content and text including content to meet code requirements.
  1. Type 1: Women's Restroom Sign: Minimum 6"x8" sign with beveled edge.
    - a. See signage schedule on drawings.
    - b. Graphics: Female symbol and wheelchair accessibility symbol, if applicable.
    - c. Text: Printed in 3/4" high Helvetica medium lettering.
  2. Type 2: Men's Restroom Sign: Minimum 6"x8" sign with beveled edge.
    - a. See signage schedule on drawings.
    - b. Graphics: Male symbol and wheelchair accessibility symbol, if applicable.
    - c. Text: Printed in 3/4" high Helvetica medium lettering.
  3. Type 3: No Smoking Sign: Minimum 6"x6" sign.
    - a. See signage schedule on drawings.
    - b. Graphics: no smoking symbol.
    - c. Text: Printed in 3/4" high Helvetica medium lettering.
  4. Type 4: Occupancy Load Sign: Minimum 8" x 8" sign with beveled edge.
    - a. See signage schedule on drawings.
    - b. Text: All text to be in 5/16" high Helvetica medium lettering.
    - c. Provide occupancy load signage in locations required by State and Local authorities.

5. Type 5: Room Name/Number Sign: Minimum 6"x6" sign with beveled edge.
  - a. See signage schedule on drawings.  
Text: All room numbers printed in 1" high Helvetica medium lettering and two lines, where needed. All room names printed in 5/8" high Helvetica medium lettering.
  
6. Type 6: Egress Plan Location Map
  - a. See signage schedule on drawings.
  - b. Minimum 10" x 12" sign with window insert to accommodate an 8.5"x11" graphic for egress map. Adjust sign size as required for graphic.
  - c. Graphics: Floor Plan of Building showing egress path and area of refuge locations in the building.
  - d. Text: "Egress Plan"
  - e. Locate at exterior doors inside the building and at all occupied spaces adjacent to doorways on corridor. Locate with input from the local fire official and confirm location with Architect.
  
7. Type 7: Exit Sign
  - a. See signage schedule on drawings.
  - b. Minimum 8" x 8" sign.
  - c. Graphics: None
  - d. Text: "EXIT"
  - e. Locate interior signs at all interior stair doors off the corridors, all exterior doors, and interior doors leading to an exit path or corridor. Final location to be coordinated with the local fire official and confirm location with Architect.
  
8. Type 8: Fire and/or Smoke Barrier
  - a. Minimum 0.5 inch lettering.
  - b. Graphics: None
  - c. Text: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS"
  - d. Locate above ceilings along wall 30 feet max apart.
  
9. TYPE 9: STANDPIPE CONTROL VALVE
  - a. See plan for size and locations.
  - b. Minimum 2 inch lettering.
  - c. Graphics: None
  - d. Text: "STANDPIPE CONTROL VALVE"
  - e. At device location.
  
10. Type 10: Identification of Buildings Utilizing Truss Type Construction Sign:
  - a. See plan for size and locations.
  - b. Minimum 14" x 8" sign.
  - c. Graphics: 12 inch long by 6 inch high, ¼ inch thick reflective red isosceles triangle.
  - d. Text: Reflective Red Roman "R" letter sized to fill the inside of the triangle without touching it.
  - e. Locate with input from the local fire official and confirm with Architect.
  
11. Type 11: Room Sign: Minimum 4"x6" sign with beveled edge.
  - a. See plan for size and locations.
  - b. Text: All room numbers printed in 1" high Helvetica medium lettering and two lines. All room names printed in minimum 5/8" high Helvetica medium lettering.

12. Type 12: Siamese Connection Sign (outdoor sign)
  - a. See signage schedule on drawings.
  - b. Minimum 2 inch lettering.
  - c. Graphics: None
  - d. Text: "SIAMESE CONNECTION for Fire Department"
  - e. At device location.
  
13. Type 13: Stair Sign (Indoor Sign) Minimum 4"x6" sign with beveled edge.
  - a. Provide at Stair to roof.
  - b. Graphics: Stair Symbol.
  - c. Text: Printed in 3/4" high Helvetica medium lettering "XXXXX".
  
14. Type: 14 In Case of Fire Do Not Use Elevator, Use Stair Sign (Indoor Sign)
  - a. See plan for size and locations.
  - b. Graphics: Person and Fire Symbol Graphic.
  - c. Text: Printed in 3/4" high Helvetica medium lettering. "XXXXX"
  
15. Type: 15 Danger Flammable Liquids (Indoor & Outdoor Sign)
  - a. See plan for size and locations.
  - b. Text: Printed in 3" high 1/2" stroke white lettering (reflective) on red background (reflective).  
DANGER FLAMMABLE LIQUIDS

## **2.4 ACCESSORIES**

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip 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.
- B. Backing Panel for Signage: Provide backing panel to match signage size and shape where signs are mounted to glass surface. Mounting using double-sided adhesive or tape. Coordinate mounting location with locations noted on drawings or as required in the field with Architect.

## **2.5 FABRICATION**

- A. General: Provide manufacturer's standard signs of configurations indicated.
  1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
  2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
  3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
  4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

## **2.6 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 a 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 the range of approved Samples. Noticeable variations in the 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.

## **2.7 ACRYLIC SHEET FINISHES**

- A. Colored Coatings for Acrylic Sheet: For copy and background and frame colors, provide colored coatings, including inks, dyes, and paints that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for (5) five years for application intended.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer): Examine conditions under which signage is to be installed and notify the construction manager in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and applicable warranty or guarantee requirements can be satisfied, submit to Design Builder written confirmation, with copies to the Owner's Representative and Architect, from appropriate Installer. Failure to submit written confirmation and subsequent installation will be indication that conditions are acceptable to the Installer.
- C. Verify that items, including anchor inserts provided under other sections of Work are sized and located to accommodate relevant signs.

### **3.2 INSTALLATION**

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
  - 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.

### **3.3 CLEANING AND PROTECTION**

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Dispose of waste legally and in accordance with local jurisdiction requirements.
- C. Comply with waste management and recycling program requirements.

### **3.4 SCHEDULES**

- A. All permanent rooms to receive room identification system containing both text and room numbers.

- B. Provide barrier-free and tactile signage at all locations required by code and as shown on the architectural drawings.
- C. Coordinate mounting heights as per CABO/ANSI A117.1 and as per manufacturer's recommendations.
- D. All room names and numbers are subject to change, supplier to verify with owner during construction phase, prior to submittal phase, for final room names and numbers.
- E. All colors to be issued during construction. Colors selected by Architect from manufacturer's full range of color options.
- F. Provide signs at all rooms as required in the signage schedule and noted on drawings. Utilize room names to generate a schedule of names. Owner to provide "Owner selected room names and numbers".

END OF SECTION – 101400

## **SECTION 102213 - WIRE MESH PARTITIONS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Standard-duty wire mesh partitions.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For units with factory-applied color finishes.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Acceptable manufacturers include the following pending submittal of the performance requirements noted in this specification:
  - 1. WireCrafters, LLC
  - 2. Kenco Wire & Iron Products
  - 3. New Wire Works Inc
  - 4. R.J. Donaldson, Inc.

#### **2.2 MATERIALS**

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Wire: ASTM A 510 (ASTM A 510M).
- C. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.
- D. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

- E. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.
- F. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.
- G. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
- H. Seismic Bracing: Angles with legs not less than 1-1/4 inch (32 mm) wide, formed from 0.040-inch- (1.0-mm-) thick, metallic-coated steel sheet; with bolted connections and 1/4-inch- (6-mm) diameter bolts.
- I. Low-Emitting Coatings: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

### **2.3 STANDARD-DUTY WIRE MESH PARTITIONS**

- A. Mesh: 0.135-inch- (3.5-mm-) diameter, intermediate-crimp steel wire woven into 1-1/2-inch (38-mm) square/orthogonal mesh.
- B. Vertical Panel Framing: 1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm) cold-rolled, C-shaped steel channels with holes for 1/4-inch- (6-mm-) diameter bolts not more than 12 inches (300 mm) o.c.
- C. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm) cold-rolled steel channels.
- D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 3/4 by 3/8 by 1/8 inch (19 by 9.5 by 3.2 mm), bolted or riveted toe to toe through mesh or one 1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm) cold-rolled steel channel with wire mesh woven through channel.
- E. Top Capping Bars: 2-1/4-by-1-inch (57-by-25-mm) cold-rolled steel channels.
- F. Posts for 90-Degree Corners: 2-by-2-by-1/8-inch (32-by-32-by-3.2-mm) square tubes with holes for 1/4-inch- (6-mm-) diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
- G. Posts for Other-Than-90-Degree Corners: Steel pipe or tubing with holes for 1/4-inch- (6-mm-) diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
  - 1. Partitions up to 12 Feet (3.7 m) High: 1-1/4-inch (32-mm) OD by 1/8 inch (3.2 mm).



- H. Adjustable Corner Posts: Two 1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm) cold-rolled, C-shaped steel channels connected by steel hinges at 36 inches (900 mm) o.c., with holes for 1/4-inch- (6-mm-) diameter bolts aligning with bolt holes in vertical framing.
- I. Line Posts: 3-inch-by-4.1-lb (76-mm-by-1.9-kg) or 3-1/2-by-1-1/4-by-0.127-inch (89-by-32-by-3.2-mm) steel channels; with 1/4-inch (6.4-mm) steel base plates.
- J. Floor Shoes: Metal, not less than 2 inches (50 mm) high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- K. Accessories:
  - 1. Sheet Metal Base: 0.060-inch- (1.5-mm-) thick steel sheet.
  - 2. Adjustable Filler Panels: 0.060-inch- (1.5-mm-) thick steel sheet, capable of filling openings from 2 to 12 inches (50 to 300 mm).
- L. Finish: Hot-dip galvanized with Powder-coated finish unless otherwise indicated.
  - 1. Color: As selected by Architect from manufacturer's full range.

## **2.4 FABRICATION**

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
  - 1. Fabricate wire mesh items to be readily disassembled.
  - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Standard-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
  - 1. Mesh: Weld mesh to framing.
  - 2. Framing: Fabricate framing with mortise and tenon corner construction.
    - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
  - 3. Fabricate wire mesh partitions with 3 to 4 inches max (75 to 100 mm) of clear space between finished floor and bottom horizontal framing.
  - 4. Mesh: Weld mesh to framing.
  - 5. Framing: Fabricate framing with welded corner construction.
    - a. Provide stiffeners as indicated or, if not indicated, as required by panel span and as recommended by wire mesh ceiling manufacturer. Weld stiffeners to framing.

## **2.5 STEEL AND IRON FINISHES**

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Field finish all field cut exposed surfaces with galvanized paint finish.

## **PART 3 - EXECUTION**

### **3.1 WIRE MESH PARTITIONS ERECTION**

- A. Anchor wire mesh partitions to floor or wall with 3/8-inch- (9.5-mm-) diameter post installed expansion anchors at 12 inches (305 mm) o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation. Provide steel shim plates to set partition posts level. Grouting of mounting plates (partition shoes) to a level condition will be considered upon submission. At wall mounting coordinate installation with steel plates and bolting pattern required for wire mesh partitions.
- B. Anchor wire mesh partitions to walls at 12 inches (305 mm) o.c. through back corner panel framing.
- C. Secure top capping bars to top framing channels with 1/4-inch- (6-mm-) diameter "U" bolts spaced not more than 28 inches (700 mm) o.c.
- D. Provide line posts at locations indicated.
- E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- F. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- G. Weld or bolt sheet metal bases to wire mesh partitions and adjacent construction where indicated or required to make the installation complete.

### **3.2 ADJUSTING AND CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION - 102213

## **SECTION 102600 – WALL AND DOOR PROTECTION**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes, but is not limited to:
  - 1. Wall Protection Systems:
    - a. Corner Guards.
  
- B. Related Section
  - 1. Division 05 – Miscellaneous Metals.
  - 2. Division 06 – Rough Carpentry
  - 3. Division 08 – Hardware
  - 4. Division 09 – Finishes
  - 5. Division 09 – Painting
  - 6. Division 09 – Gypsum Board Assemblies
  - 7. Division 10 – Signage

#### **1.2 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in DIVISION 01 SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Shop drawings showing methods of attachment to substrate.
  - 2. Samples: For selection of color, pattern, and surface texture.
    - a. 12-inch (300 mm) long samples of each type of wall and corner guard required. Include examples of joinery, corners, and field splices.
    - b. 7 x 9-inch (175 x 225 mm) samples of each rigid sheet or panel type wall surface protection material required.
- C. Sustainability & Environmental Submittals:
  - 1. Indoor Environmental Quality – provide VOC compliant materials in the state and jurisdiction the project is located.
  - 2. Provide products, where possible, that are manufactured within a 500-mile radius of the project site and are a locally produced material which supports regional materials and resources.
  - 3. Comply with recycling program and waste management procedures required by the local jurisdiction.
- D. Contract Closeout Submittals: Comply with the applicable sections noted in DIVISION 1, including but limited to the following:
  - 1. Closeout Documents and Procedures.
  - 2. Operation and Maintenance Data.
  - 3. Project Record Documents.
  - 4. Demonstration and Training.

### **1.3 QUALITY ASSURANCE**

- A. Manufacturer's qualifications: Not less than (5) five years of experience in the production of specified products and a record of successful in-service performance.
- B. Code compliance: Assemblies should conform to all applicable codes including IBC-NJ, UCC, and relevant Life Safety and Barrier Free code compliance in the State where the project is located.
- C. Fire Performance Characteristics: Comply with ASTM E 84 for the fire performance characteristics indicated below. Identify components with markings from testing and inspection organization.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 450 or less.
- D. Single Source Responsibility: Obtain wall surface protection system components from a single source.
- E. Installer Qualifications: A Firm / Installer with a minimum of 5 years successful experience in installation of sealers for a similar size and type of project. Provide list of projects with contact names, Owner's, and project locations.
- F. Maintenance data.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original factory wrappings and containers, clearly labeled with manufacturer and brand name.
- B. Store materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
- C. Maintain room temperature within the storage area between 60° F (16° C) and 80° F (27° C) during the period plastic materials are stored. Keep materials out of direct sunlight to avoid excessive surface temperatures.
- D. Store rigid plastic corner guard, wall guard, and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attains the ambient room installation temperature of between 65° F (18° C) and 75° F (24° C).
- E. Handling: Protect materials during handling and application to prevent damage or contamination.

### **1.5 ENVIRONMENTAL REQUIREMENTS / PROJECT CONDITIONS**

- A. Maintain ambient temperature within building at not less than 65° F (18° C) or greater than 75° F (24° C) for a minimum 72 hours prior to beginning of installation.
- B. Do not install wall surface protection system components until the space is enclosed, weatherproof and climate controlled.
- C. Do not install semi-rigid wall protection systems until temperature is stable and permanent lighting is in place.

### **1.6 MAINTENANCE**

- A. Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- B. Replacement Materials: Minimum 2% of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as installed materials. Package with protective coverings and appropriate labels.

### **1.7 WARRANTY**

- A. Warranty: Provide manufacturer's standard form product warranty, minimum (5) five-year warranty.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. As a basis of design details and specifications have been based on specified products by following manufacturers:
1. Koroseal Wall Protection Systems, Louisville, KY. Ph: 855-753-5474; Fax: 330-668- 7703; Internet Address: [www.korogard.com](http://www.korogard.com), or approved equal.
  2. Other products that may be acceptable upon a compliance review.
    - a. InPro Corporation (IPC).
    - b. Construction Specialties, Inc.
    - c. Or approved equal.

### **2.2 MATERIALS**

- A. Flush-Mounted, Plastic-Cover Corner Guards as indicated on drawings. Provide manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface, installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.

### **2.3 CORNER GUARDS**

- A. Provide corner guards as show on drawings.
1. Flush-Mounted, Resilient Plastic Corner Guards:
    - a. Cover: Rigid, impact-resistant plastic, nominal 0.078 inch (2.0 mm) thick, in dimensions and profiles indicated.
    - b. Retainer: Continuous, one-piece, extruded aluminum retainer, nominal 0.062 inch (1.6 mm) thick.
    - c. Series / Product: R100 Series; 2-inch (50 mm); Corner Radius: 1/4 inch (6.35 mm).
    - d. Color: As selected by Architect from full range of options.
  2. Accessories: Aluminum base with concealed splices, mounting hardware, and other accessories as required to make the installation complete.
    - a. Color: As selected by Architect from full range of options.

### **2.4 FABRICATION**

- A. General:
1. Fabricate wall protection systems to comply with requirements indicated for design, dimensions, detail, finish, and member sizes.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions (by Installer/Applicator): Examine conditions under which products of this section are to be installed in coordination with Installer of materials and components specified in this Section and notify the General Contractor in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions are acceptable to ensure proper and timely installation of the proposed products and confirms requirements for applicable warranty or guarantee can be satisfied; submit to General Contractor written confirmation, with copies to the Owner's Representative and Architect, from

applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

1. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
2. Complete finishing operations, including painting, before beginning installation of wall surface protection system materials.
3. Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.
4. Do not proceed with installations until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface / Substrate Preparation - Properly prepare substrate and clean to remove dust, debris, and loose particles.

### **3.3 INSTALLATION**

- A. Prepare concrete surfaces in accordance with manufacturer's instructions.
- B. Install wall surface protection units' plumb, level, and true to line without distortions.
- C. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.
- D. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer's instructions.
- E. Where splices occur in over 20 feet runs (6 m), splice aluminum retainer and plastic cover at same locations along the run.

### **3.4 CLEANING**

- A. Clean plastic covers and accessories using a standard non-ammonia-based household cleaning agent.
- B. Clean metal components in accordance with the manufacturer's recommendations.
- C. Remove excess adhesive in manner recommended by manufacturer.
- D. Dispose of all waste legally and in accordance with local jurisdiction requirements.
- E. Comply with waste management and recycling program requirements.

END OF SECTION - 102600

## **SECTION 102800 - TOILET AND BATH ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes, but is not limited to, the following:
  - 1. Under-lavatory Guards.
  - 2. Custodial Accessories
  - 3. Toilet and Bath Accessories.
  - 4. Wall Mirrors.

#### **1.2 RELATED REQUIREMENTS**

- A. Division 01 - Specifications
- B. Division 04 – Unit Masonry
- C. Division 06 - Rough Carpentry
- D. Division 09 – Gypsum Board Assemblies
- E. Division 09 – Tiling
- F. Division 10 – Toilet Compartments

#### **1.3 REFERENCES STANDARDS**

- A. ASTM A 167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip; 1999 (Reapproved 2004).
- B. ASTM A 666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate and Flat Bar; 2003.
- C. ASTM C 1036 – Standard Specification for Flat Glass; 2006
- D. GSA CID A-A-3002 – Mirrors, Glass; U.S. General Services Administration; 1996.

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of masonry and concrete anchors.

#### **1.5 SUBMITTALS**

- A. Procedure: Comply with submittal requirements indicated below and as stipulated in Division 01 (013300) SUBMITTALS.
- B. Product Data: Submit manufacturer's product literature, technical specifications, application instructions, product storage and handling requirements, and similar data for each product specified below as required to demonstrate compliance with specified requirements and provide complete application information.
  - 1. Product Data: For each type of product indicated.
    - a. Toilet and Bath Accessories: Submit manufacturer's standard detail drawings, cut sheets, specifications and installation instructions for each accessory listed applicable schedules, and shown on Drawings.
    - b. Wall Mirrors: Submit manufacturer's standard detail drawings, specifications, and installation instructions for wall mirror units.
- C. Barrier Free Compliance: Comply with the NJUCC, IBC-NJ; and Building Code Barrier Free sub-code, and with code provisions as adopted by authorities having jurisdiction.
- D. Product Schedule:
  - 1. Identify locations using room designations indicated on Drawings.

2. Identify products using designations indicated on Drawings and schedule.

E. Sustainability / Environmental Submittals: Show evidence including but not limited to the following:

1. Indoor Environmental Quality - product is VOC compliant in the state and jurisdiction the project is located.

F. Contract Closeout Submittals: Comply with Division 00 and 01 specifications.

## **1.6 QUALITY ASSURANCE**

A. Regulatory Requirements: Comply with the NJUCC, IBC-NJ; Barrier Free sub-code, and with code provisions as adopted by authorities having jurisdiction.

B. Electrical Components, Devices and Accessories: Listed and labeled by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

C. Qualifications:

1. Manufacturer: Obtain each product type and all associated accessories through one source from single manufacturer.

2. Installer: Workers to be approved by manufacturer and supply list of recently completed installations. Within the past (5) years with contract information of owner project location/description.

## **1.7 PROJECT/SITE CONDITIONS**

A. Field Measurements: Where dimensions of surfaces on which they are installed determine sizes of products, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

A. Storage and Protection: Provide secure location for accessories delivered to Project.

## **1.9 SEQUENCING AND SCHEDULING**

A. Schedule delivery and installation of items to avoid delay of Project.

B. Coordination:

1. Coordinate with steel stud and carpentry work to provide suitable back up to support units attached to stud walls.

2. Coordinate with supplier of metal toilet partitions to obtain suitable reinforcement properly located to receive grab bars in handicap stalls.

## **PART 2 - PRODUCTS**

### **2.1 TOILET ROOM ACCESSORIES**

A. Refer to schedule of accessories noted on the drawings.

B. Basis-of-Design Product: The design for accessories is based on products from Bobrick, as listed on the toilet accessories schedule described on the drawings or an approved equal. Other products from one of the following may be acceptable upon a compliance review:

1. American Specialties Inc.

2. Bradley Corporation.

3. Or approved equal



## **2.2 CUSTODIAL ACCESSORIES**

- A. Refer to schedule of accessories noted on the drawings.
- B. Basis-of-Design Product: The design for accessories is based on products from Bobrick or approved equal. Other products from one of the following may be acceptable upon a compliance review:
  - 1. American Specialties Inc.
  - 2. Bradley Corporation.
  - 3. Or approved equal

## **2.3 FABRICATION**

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine conditions under which toilet and bath accessories are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Design Builder in writing, with copies to the Owner's Representative and Architect, of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Design Builder written confirmation, with copies to the Owner's Representative and Architect, from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
  - 1. Verify existing conditions before starting work.
  - 2. Verify exact location of accessories for installation.
  - 3. Verify that field measurements are as indicated on drawings.
  - 4. See Division 04 Masonry to coordinate installation with masonry anchors and reinforcing in walls.
  - 5. Refer to Division 06 Rough Carpentry for coordination with blocking and framing materials.
  - 6. Refer to Division 09 Gypsum Board Assemblies to coordinate installation with framing and board materials.

### **3.2 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings and as follows:
  - 1. Bottom of Mirrors: See contract drawings. Mount in locations so the mirror does not conflict with and adjacent product or device. Do not proceed with work if a conflict exists. Rectify conflict with Architect and proceed with installation once conflict is resolved.
  - 2. Grab Bars at Barrier-Free Stalls: See contract drawings. Mount in locations so the grab bars does not conflict with and adjacent product or device. Do not proceed with work if a conflict exists. Rectify conflict with Architect and proceed with installation once conflict is resolved.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

- E. Toilet and Bathroom Accessory Installation: Install concealed mounting devices and fasteners fabricated of same material as accessories or of galvanized steel. Install exposed mounting devices and fasteners finished to match accessories. Provide theft-resistant fasteners for all accessory mountings. Secure toilet room accessories and related items to adjacent walls and partitions complying with the manufacturer's instructions for each item and for each type of substrate construction.
- F. Wall Mirror Installation: Secure mirrors to walls in concealed "tamperproof" manner with special hangers, toggle bolts, or screws. Set unit straight and square at locations and mountings shown in accordance with manufacturer's instructions.
- G. Provide solid substrate of fire-retardant treated wood blocking to properly support all accessories in framed construction.
- H. Report any conflicts in layout prior to installation of any devices.
- I. Coordinate installation of all devices with plumbing devices and electrical devices to avoid conflicts. Report any conflicts prior to installation.

### **3.2 ADJUSTING/CLEANING**

- A. Lubricate bearings and sliding parts; adjust to ensure smooth, easy operation.
- B. Clean all device surfaces and clean adjacent surfaces soiled by device installation. Avoid use of abrasive cleaners or solutions containing corrosive solvents. Use cleaning materials recommended by manufacturer.
- C. Dispose of waste legally.
- D. Comply with waste management and recycling program requirements.

END OF SECTION - 102800

## SECTION 125000 - FURNITURE

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. The Vendor shall document, specify, procure, and install all systems furniture necessary to accommodate the occupancies identified under this Specification.
- B. Refer to Bid documents for room layouts and furniture requirements as defined by the contract documents.
- C. **All bidders shall attend a Pre-Bid site walkthrough. The site is an active / occupied site and Personal Protective Equipment including masks, hard-hat, boots, safety vest, and safety glasses are required.**

#### 1.2 BID DOCUMENTS

- A. The contract of the parties at the time of Bid shall submit:
  - 1. Photos of furniture
  - 2. Layout drawing (CAD drawing will be issued upon request)
  - 3. Qualifications

#### 1.3 QUALIFICATIONS OF BIDDERS

- A. No bid will be considered unless the firm submitting the bid can meet the following conditions:
  - 1. That it has in operation, or is an established representative of, a factory adequate for and devoted to the manufacturer of equipment which it proposes to furnish and has the necessary specialized dies, molds and tools to provide the proper service, fittings, hardware and accessories.
  - 2. That such manufacturers proposed have been engaged in the manufacturer of similar equipment as that specified for a period of not less than ten (10) years and have a suitable organization to manufacture, furnish and deliver the equipment, all in accordance with pertaining codes, and the bidder shall have completed contracts of the kind and size contemplated by the specification and proposal within the past five years which have proven satisfactory under similar operation conditions.
  - 3. The bidder must have financial and physical resources of sufficient scope to assure prompt and satisfactory performance in the execution of the total conditions of this specification and in the production, furnishing and delivery of all equipment specified so as not to delay the progress of the work.

#### 1.4 PRODUCT SUBSTITUTIONS

- A. Acceptable products and materials are defined in this Specification. The materials, products and equipment described in the Contract Documents establish a standard of function, dimension, appearance, and quality to be met by any proposed substitution.
- B. During the bidding period written requests for substitution of products will be considered if submitted in writing and in accordance with the contract document requirements.
- C. Submit a separate request for each product, supported with complete data, drawings, and samples as appropriate, including the following:
  - 1. Comparison of the qualities of the proposed substitution with that specified.
  - 2. Changes required in other elements of the work because of the substitution.
  - 3. Effect on the Delivery Schedule.
  - 4. Cost data comparing the proposed substitution with the product specified.
  - 5. Any required licensing fees or royalties.

6. Availability of maintenance service, and source of replacement materials.
- D. The Owner and Architect shall be the judge of the acceptability of the proposed substitution.
- E. Contractor's Representation: A request for a substitution constitutes a representation that the Contractor:
  1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified and will provide written justification to support the same.
  2. Will provide the same warranties or bonds for the substitution in the work and make such other changes in the work as may be required for installation to make the work complete in all respects at no additional cost.
  3. Will coordinate the installation of an accepted substitution in the work and make such other changes in the work as may be required for installation to make the work complete in all respects.
  4. Will waive all claims for additional costs, under its responsibility, which may subsequently become apparent.
- F. The Owner and Architect will review requests for substitution with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

## **1.5 FURNITURE STANDARDS OF QUALITY**

- A. Furniture shall meet or exceed the following standards of quality:
  1. References and Standards:
    - a. ANSI/BIFMA X5.5-2008 Desk/Table Products
    - b. ANSI/BIFMA X5.6-2010 Panel Systems
    - c. ANSI/BIFMA X5.9-2012 Storage Units
  2. Flammability:
    - a. Components shall meet requirements for flame spread and smoke development as specified by NFPA 101.
    - b. Testing shall be conducted in accordance with either ASTM E84, UL 723, or NFPA 255 on the entire assembled panel and each different combination of fabric and interior construction. In addition, the fabric shall meet the requirements of NFPA 265.
    - c. Panel flame spread shall not exceed 25 for Class A, and panel smoke development shall not exceed 450 for Class A, B, and C.
  3. Electrical System:
    - a. The electrical system shall meet the requirements of UL 1286.
    - b. Receptacles shall be 15 amp (NEMA 5-15R) commercial grade conforming to NEMA WD 1 and NEMA WD 6.
  4. Cabling:
    - a. Raceways and interfaces to the raceways shall be designed to accommodate the bend radius as shown in TIA-569-B for fiber optic cables communication wiring.
  5. Work Surface Material
    - a. ANSI A208.1-2009 Particleboard.
    - b. ANSI A208.2-2009 Medium Density Fiberboard.
    - c. ANSI/NEMA LD 3-2005 High Pressure Decorative Laminates (HPDL).
  6. Environmental Features:
    - a. The product submitted shall have 3rd party certification for IAQ (GREENGUARD or equivalent). All components must have reduced VOC emissions by using water-based adhesives.

- b. All components must offer PVC-free power components to avoid potential long-term human and environmental impacts that have been associated with the manufacture and future disposal of PVC.
  - c. Fabrics shall be available which meet MBDC Cradle-to-Cradle sustainable design certification. These fabrics contain less than 100 parts per million of any heavy metals of concern, which includes antimony, which is traditionally found in polyester fabrics.
  - d. All painted components must be coated with powder coat paint, which results in minimal waste, consumes less energy and requires no solvents, compared to traditional wet paint processes.
7. Warranty and Testing Information
- a. Manufacturer must offer a lifetime warranty that product shall be free from defects in materials and workmanship (includes shipping, parts and labor for the repair or replacement of any defective item.)
  - b. The following lifetime warranty exceptions shall be allowed:
    - 1) Laminates and wood veneers shall have a minimum 12-year warranty from Physical Completion.
    - 2) Modular power components shall have a minimum 12-year warranty from Physical Completion.
    - 3) Vertical surface textiles shall have a minimum 12-year warranty from Physical Completion.
    - 4) Paint colorfastness shall have a minimum 5-year warranty from Physical Completion.
    - 5) Marker boards shall have a minimum 3-year warranty from Physical Completion.
  - c. Systems furniture panels shall meet or exceed the ANSI/BIFMA X5.6 Panel System tests. This test standard specifies acceptance levels to help ensure reasonable safety and performance.
  - d. Systems furniture panel wiring shall meet or exceed UL 183 Manufactured Wiring Systems tests.
  - e. System furniture panels shall be designed for installation in compliance with the National Electric Code (NFPA 70 - 2011).
  - f. NFPA 101 compliant systems furniture panels shall be available in standard offering.
  - g. Standard system furniture panel fabrics shall meet or exceed UL 723 Surface Burning Characteristic of Building Materials tests. Flammability testing to use NFPA 255 guidelines.
  - h. Standard systems furniture panel fabrics shall meet or exceed UL 1286 Standard for Safety of Office Furnishings tests. This standard utilizes the ASTM E 84 Tunnel Test method to simulate a sprinklered occupancy, as opposed to the alternative NFPA 265 Room Corner Test method.
  - i. Systems furniture panels shall meet the following minimum acoustic ratings per ASTM C423 and E795 (NRC) and ASTM C413 and E90 (STC):
    - 1) Panel with Performance Tackable Acoustic Skins – NRC: .65, STC: 16.
    - 2) Panel with Tackable Acoustic Skins – NRC: .55, STC: 7.
8. General Requirements:
- a. The completed installation shall comply with NFPA 70 and NFPA 101. The wall system shall be capable of structurally supporting multiple-hung appurtenances, including, but not limited to, cantilevered work surfaces, fully loaded shelves, files, and other components, as well as allow unlimited off-module horizontal attachment locations for these components.
  - b. Panel supported components shall have a positive integral locking device which secures the components without the use of additional screws or clamps.
  - c. The panel system shall be able to integrate with the manufacturer's other products.
  - d. Panels shall be constructed of vertical and horizontal elements assembled at the factory or on-Site.
  - e. Panel frames shall allow the sharing of vertical elements between adjacent panels.
  - f. All panels and components shall be movable without disassembly.

- g. Panel shall be monolithic with removable tiles that can be removed in the field without tools to allow for internal access to the panel frame, telecommunications, and data cabling.
- h. The removal of surfaces shall be accomplished without disassembling the workstation and/or panel run.
- i. Each fabric faced frame cover shall have a seamless width of fabric stretched over the entire surface of the cover. The color used for each fabric shall be from the same dye lot.
- j. Tackable / acoustical fabric tiles shall have steel frames or steel reinforced edges with tackable fiber filler. Tile corners shall be mechanically reinforced to ensure 90-degree angles. Tiles shall be secured to panel frame by means of brackets, attachment clips, or similar fastening method for secure and level attachment, and to maintain a tight fit of the tile against the panel frame.
- k. Panel tiles and frames shall have light seals.
- l. The face finish shall be attached securely and continuously along the entire perimeter of the cover.
- m. Fabrics shall be factory installed on initial installation.
- n. Raceways covers shall be an integral part of both powered and non-powered panels.
- o. System panels shall have adjustable leveling glides.
- p. The system shall be capable of being installed on top of finished flooring without the penetration of the finished floor.
- q. Return panels used for the system's structural stability shall at a minimum match the depth of the work surfaces. Work surfaces shall be able to be attached with proper return panels without the need for counterbalancing.
- r. Panel connection hardware shall be universal or shall be a connector system that allows for the setup of any configuration.
- s. The Vendor shall provide locks and keys.
- t. The Vendor shall provide list of furniture accessories that may be purchased separately.

#### **1.6 QUALITY ASSURANCE**

- A. All freestanding furniture shall have a limited fifteen (15) year warranty from Physical Completion for all frames, components, surfaces and parts except upholstery materials, which shall have a five (5) year warranty from Physical Completion.

#### **1.6 INSTALLATION**

- A. Include all freight costs for Phased Installation. Installation shall be during normal business hours, using prevailing wages.
- B. Installation shall be phased in accordance with the contract documents and the Owner's schedule:
  - 1. Phase 1 shall include the following rooms:
    - a. See Phasing Drawing A-702. Refer to project schedule for completion dates.
  - 2. Phase 2 shall include the following rooms:
    - a. See Phasing Drawing A-702. Refer to project schedule for completion dates.

#### **1.7 MATERIAL DELIVERY**

- A. All deliveries shall be coordinated with the Owner's occupancy of the building and site. Delivery location on site shall be coordinated with Owner's operations and on-site manager. Deliveries shall be made between during hours of 9am - 4pm.**

**B. Packaging and Crating**

1. The Contractor shall not ship any new materials and equipment that will require even temporary modification to the present facility, without first obtaining permission from the Architect.
2. The Contractor shall not ship to, store or install any materials and equipment at a location undergoing construction activities or which is in any way not a suitable environment for the long-term operation, maintenance and aesthetic quality of the equipment, as determined by the Architect.
3. Verification of proper separation into shipping groups, installation of any required shipping brackets and/or protective packaging, securing of cables and other parts, and all recommended shipping preparations shall be performed in conformance with the requirements of the OEM.
4. All external surfaces shall be thoroughly cleaned, and all paint chips, broken parts, and other signs of use and/or abuse shall be repaired. Interiors of equipment shall be carefully cleaned and vacuumed to remove dust and any loose hardware.
5. The Contractor shall prepare, pack, and ship all materials and equipment in a manner that is consistent with OEM recommendations and shall not perform any actions that invalidate any manufacturer's warranties or prevent the assumption of a commercially available maintenance contract. All materials and equipment shall be shipped in an "as-new" condition.
6. The Architect/ Owner reserves the right to reject any damaged material or equipment. Damage to the facility, and/or equipment or material installed under this contract, resulting from the contractor's neglect or failing to follow a standard of care necessary to provide adequate protection, shall be repaired to the satisfaction of the Architect. Materials and equipment or material rejected by Architect/ Owner shall be replaced by the Contractor at the Contractor's expense.
7. The materials and equipment shall be prepared for shipment to avoid damage in transit and to facilitate installation.
8. Packaging and crating methods shall meet or exceed equipment OEM recommendations. Equipment shall be shipped assembled and complete wherever possible.
9. The Contractor shall inspect the size and nature of available doors, bays, elevators, and shafts with access to the installation sites. The System elements shall be shipped in modules that can be moved into place without requiring structural alteration of any building. The Contractor shall assure that the weight and dimensions of the shipped material including all packaging and crating shall not exceed the dimensions or capacity of the elevator, doors, bays, shafts, etc. through which passage is required to deliver the material to its final shipping location as directed by the Architect.
10. Each package, crate, or part shall be clearly marked with the name of the consignee, shipping destination, Client order number, and other such markings, as appropriate. Complete packing lists shall be supplied showing contents and identity of each package. One copy of the list shall be securely attached to the outside of each shipping unit, and two copies of the list shall be sent to the Owner by overnight express on the day of shipment.

**C. Deliveries to Owner Building / Site:**

1. The Contractor shall coordinate the date and time of delivery and installation with the Architect / Owner. Delivery shall be preceded in each case by at least thirty (30) calendar days written notice from the Contractor to the Owner setting forth the proposed delivery date. A trucking list with the truck details and driver's names must be included in written request. The Owners Police Department team is required to maintain security at entrances.
2. Contractor may deliver material by truck to the site / building location coordinated by the Contractor with the Owner.
3. Access routing of personnel, equipment and materials shall be as directed by the Owner. The Contractor shall schedule deliveries to minimize space and time requirements for the storage of materials and equipment on site and to minimize disruptions to the Owners operations.
4. Personnel access will be limited to a specific entrance, depending upon the delivery time of day. Delivery of material and movement of material through public areas shall be restricted as required by the Owner. The Architect with input from the Owner may approve limited exceptions to this rule.

### **1.8 CONTRACTOR'S USE OF THE SITE AND PREMISES**

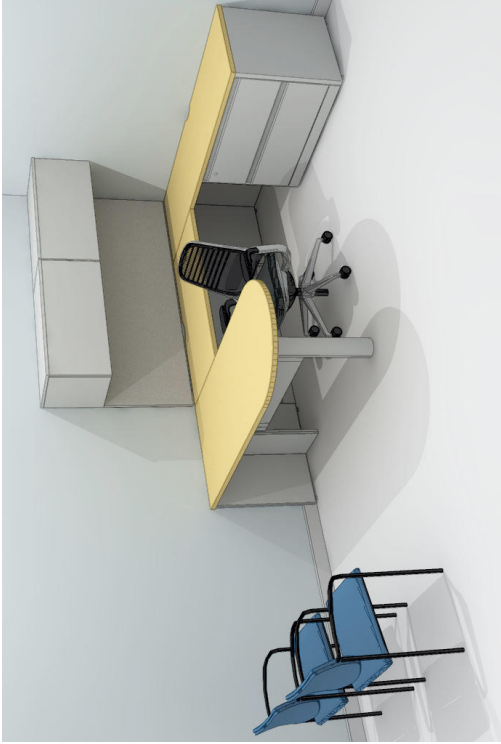
- A. Occupancy: Owner and the public will occupy the buildings and site during the performance of the work. The Contractor shall cooperate with the Owner to minimize conflict due to occupancy and shall not interfere with the public or Owner's operations. Only portions of the immediate area of the work of this contract will be restricted for the Contractor's use at any one time.
- B. Holiday Restrictions
  - 1. Coordinate Holiday restrictions with the Owner.
- C. The Contractor shall be responsible for all damage to buildings, walls, utilities, lights, or other property not scheduled for demolition caused by the work, whether such damage be at or adjacent to the site of the work or caused by transporting or hauling to or from the work site. The Contractor shall repair, replace, or arrange for the repair or replacement of all such damage to the satisfaction of the Architect. Any material damaged by the Contractor's operations shall be replaced at no cost to Owner, with new material matching the original.
  - 1. The Contractor shall keep roadways, parking areas, and entrances serving the building and site clear and available to the Owner's employees and the public at all times. The Contractor shall not use these areas for parking or storage of materials unless 72-hour prior approval is provided by the Owner.
  - 2. Contractor shall not reduce the width of any passage, entrance, or other access to, or within the building without the express prior written approval of the Owner / Architect. Contractor shall eliminate such reduction immediately when so requested by the Owner / Architect.
  - 3. The Contractor shall limit use of the premises for work and for temporary storage and make personnel assignments so as to allow for:
    - a. Owner access to and use of its facilities, including emergency exits.
    - b. Public's access to and use of facilities.
    - c. Work by separate Contractors.
    - d. Unimpeded means of egress from the facility, emergency exits and from work areas.
    - e. Coordination of the use of premises under the direction of the Architect.
    - f. Confinement of operations at the site to the areas permitted under the contract.
    - g. Portions of the site beyond areas at which work is indicated shall not be disturbed.

### **1.9 FURNITURE LIST**

- A. Products (All quantities shall be the responsibility of the Vendor).
- B. Furniture for the Project shall include, but is not limited to, the following:
  - 1. Refer to the attached reference drawings from Dancker (D1 thru D9):
    - i. Dispatch Center Expansion Phase by Dancker; or approved equal.
    - ii. Phase 1: See Drawing A-702
      - 1. Phase 1 – System Office – D1
      - 2. Phase 1 – Directors Office – D2
      - 3. Phase 1 – Radio Tech Office – D3
      - 4. Phase 1 – Breakroom – D4
      - 5. Dispatch Center Expansion – Floor Plan Drawing – D5
      - 6. Dispatch Center Expansion – Kitchen Counter Details 1 & 2; Recycle Cabinets Details 3&4; Typical Locker Details 5&6 – D6
    - iii. Phase 2: See Drawing A-702
      - 1. Phase 2 Training Room – General Seating – D7
      - 2. Phase 2 Training Room – Table Seating with chairs for 19 layout 1 – D8
      - 3. Phase 2 Training Room – Table Seating with chairs for 19 layout 2 – D9

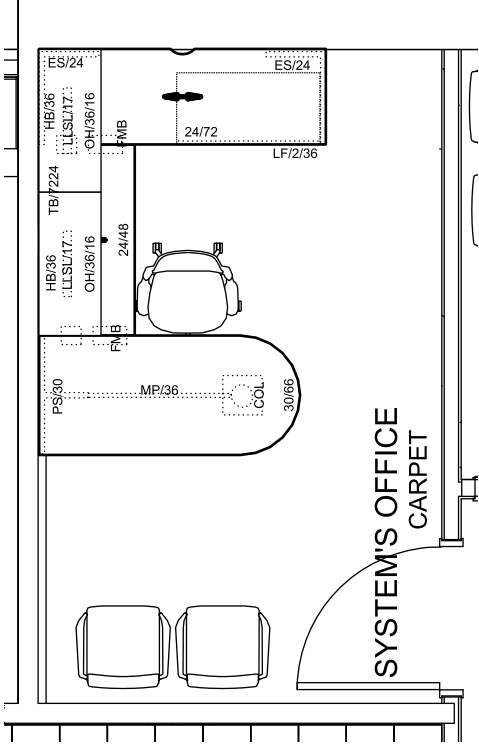


2. Refer to the attached reference drawings from Modern Office Systems (A101 – A102):
  - i. Dispatch Center Expansion Phase by Modern Office Systems; or approved equal.
    1. Phase 1 – A101 Lockers / Modular Casework
    2. Phase 1 – A102 Lockers / Modular Casework



**Description:**  
 U Shape Desk  
 Worksurface-Bullet peninsula, Plastic edge,  
 Laminate, Curved, 30D x 65 1/2W  
 Bridge : 24 x 48  
 Back Credenza: 24 x 78

**Components**  
 Underneath Storage : 36" W x 18 deep - 2  
 High Lateral File



**Steelcase Series 1**



**Player**  
seating

The four-leg version of the Player chair stacks six-high on the floor and eight-high on the dolly. Available with or without arms.



**UNION COUNTY DIV. OF ENGINEERING**

NORTH AVE  
 WESTFIELD, NJ

**DISPATCH CENTER EXPANSION  
 PHASE 1  
 SYSTEM OFFICE**



291 Evans Way  
 Somerville, NJ 08876  
 908.231.1600  
 dancker.com

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**DENISE BOMBERG**

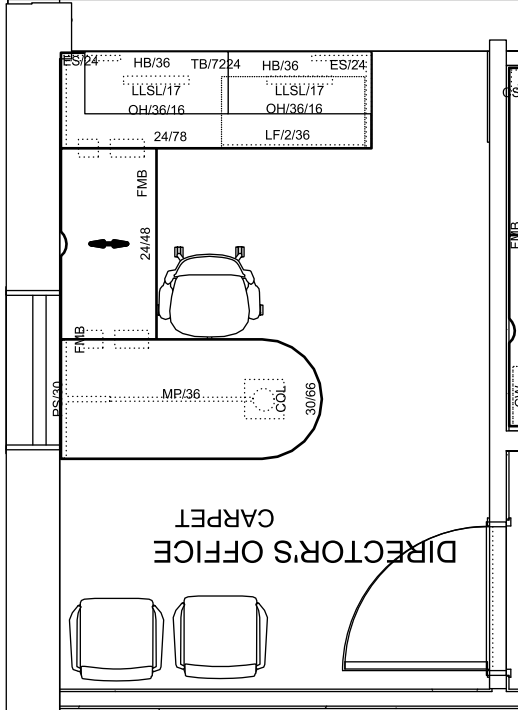
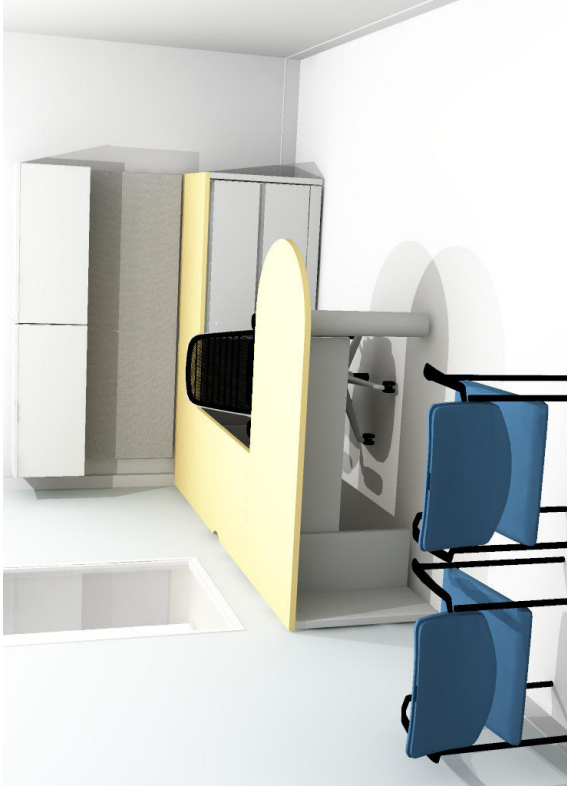
ARCHITECT / DESIGNER  
**dancker**

DRAWN BY  
**S.TUTIVEN**

DATE	SCALE
8/20/2020	0 = 10"
PROJECT #	DRAWING #
181545	D1

**Description:**  
 U Shape Desk  
 Worksurface-Bullet peninsula, Plastic edge,  
 Laminated, Curved, 30D x 65 1/2W  
 Bridge : 24 x 48  
 Back Credenza: 24 x 78

**Components**  
 Underneath Storage : 36" W x 18 deep - 2  
 High Lateral File



**Steelcase Series 1**



**Player seating**

The four-leg version of the Player chair stacks six-high on the floor and eight-high on the dolly. Available with or without arms.



UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
 WESTFIELD, NJ

DISPATCH CENTER EXPANSION  
 PHASE 1  
 DIRECTOR'S OFFICE



291 Evans Way  
 Somerville, NJ 08876  
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**DENISE BOMBERG**

ARCHITECT / DESIGNER  
**dancker**

DRAWN BY  
**S.TUTIVEN**

DATE	SCALE
8/20/2020	0 = 10"
PROJECT #	DRAWING #
181545	<b>D2</b>



Description:  
 Universal Worksurface-Straight, Laminate,  
 Plastic edge profile  
 (1)24D x 42  
 (1)24D x 48  
 (1)Worksurface-Corner, Curved, 24DL x  
 24DR x 42WL x 42WR

Components Underneath:  
 Pedestal-Fixed, 2 box / 1 file, Flush steel  
 front, 22 5/8D x 15W x 27H  
 Universal; Lateral file, 2 drawers, Flush steel  
 front, 24D x 30W x 28H

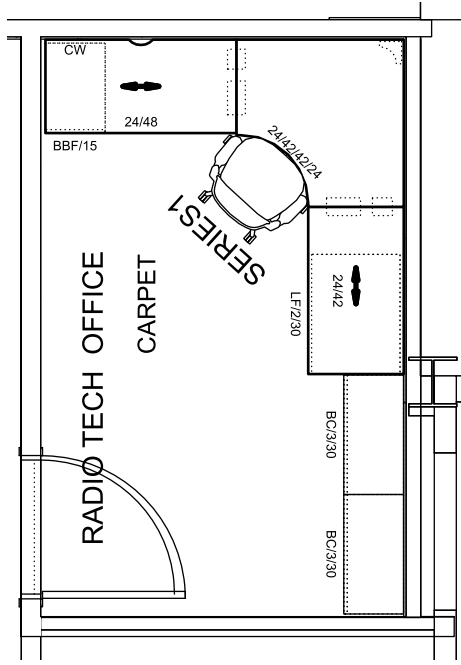
(2) Universal; Bookcase, 3 adjustable  
 shelves, Enhanced, 15D x 30W x 52 1/2H



Steelcase Series 1



**SURFACE  
 MOUNTED POWER  
 STRIP**  
 24-in. 18 Outlet  
 Aluminum Power  
 Strip with 15' Cord,  
 cETLus Listed



UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
 WESTFIELD, NJ

DISPATCH CENTER EXPANSION  
**PHASE 1**  
**RADIO TECH OFFICE**

ACCOUNT MGR

DENISE BOMBERG

ARCHITECT / DESIGNER

dancker

DRAWN BY

S.TUTIVEN

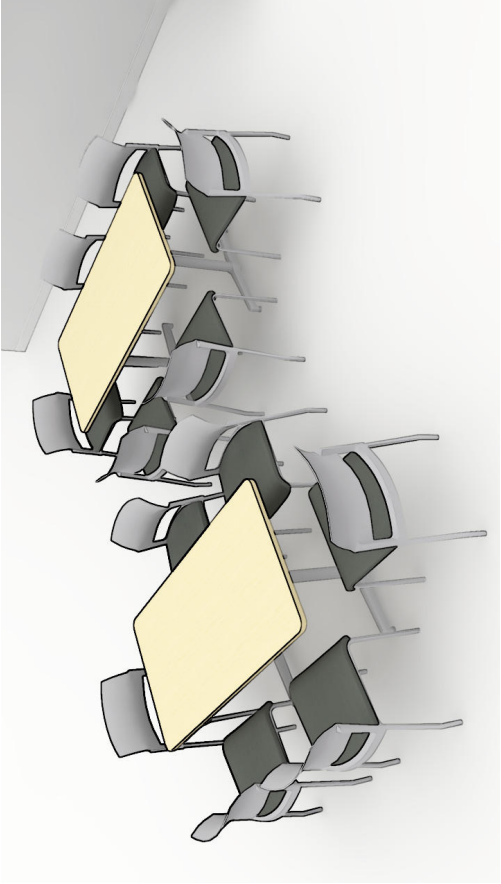
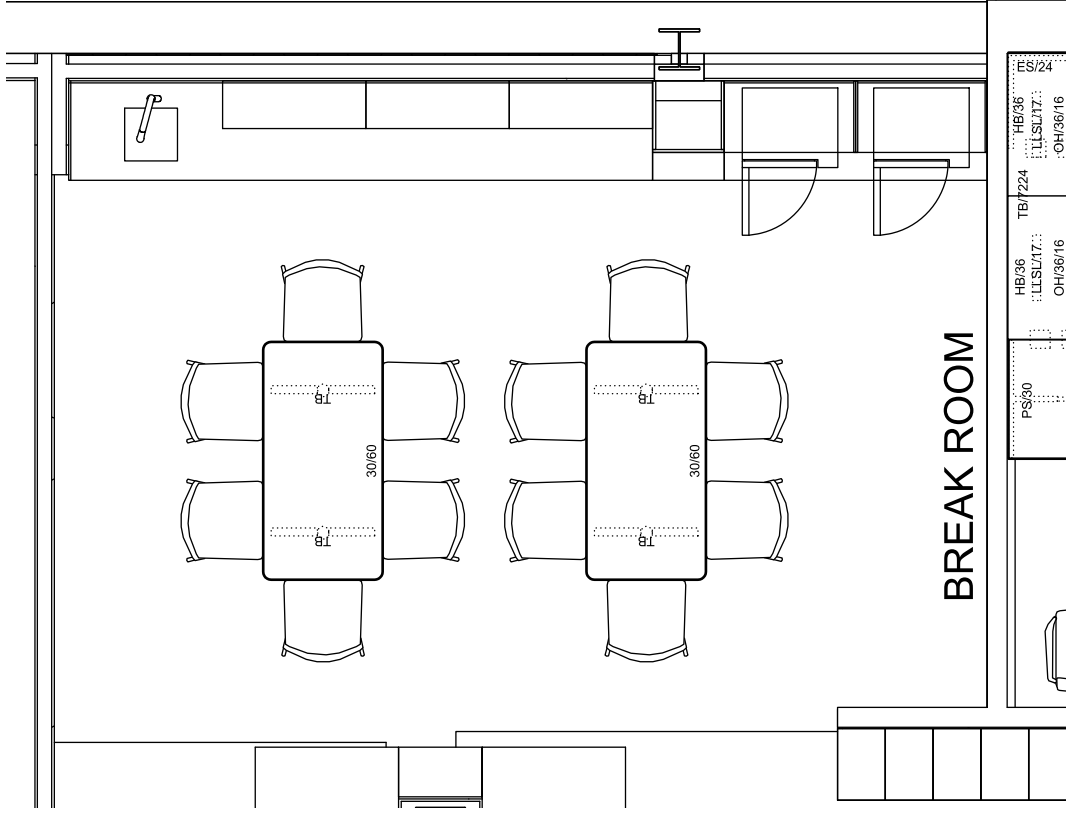


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DATE	SCALE
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PROJECT #	DRAWING #
181545	D3



**Description:**  
30x60 Universal Straight Table with T-Base

**Finishes**  
Laminate: Arctic White LPL  
Base: Metal T- leg - Black

**Location**  
Breakroom



**Move™**  
multipurpose seating

Pull up a few Move chairs  
conveniently stack 5-high on the  
floor, or up to 10 on the optional  
dolly.

UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
WESTFIELD, NJ

DISPATCH CENTER EXPANSION

PHASE 1  
BREAKROOM

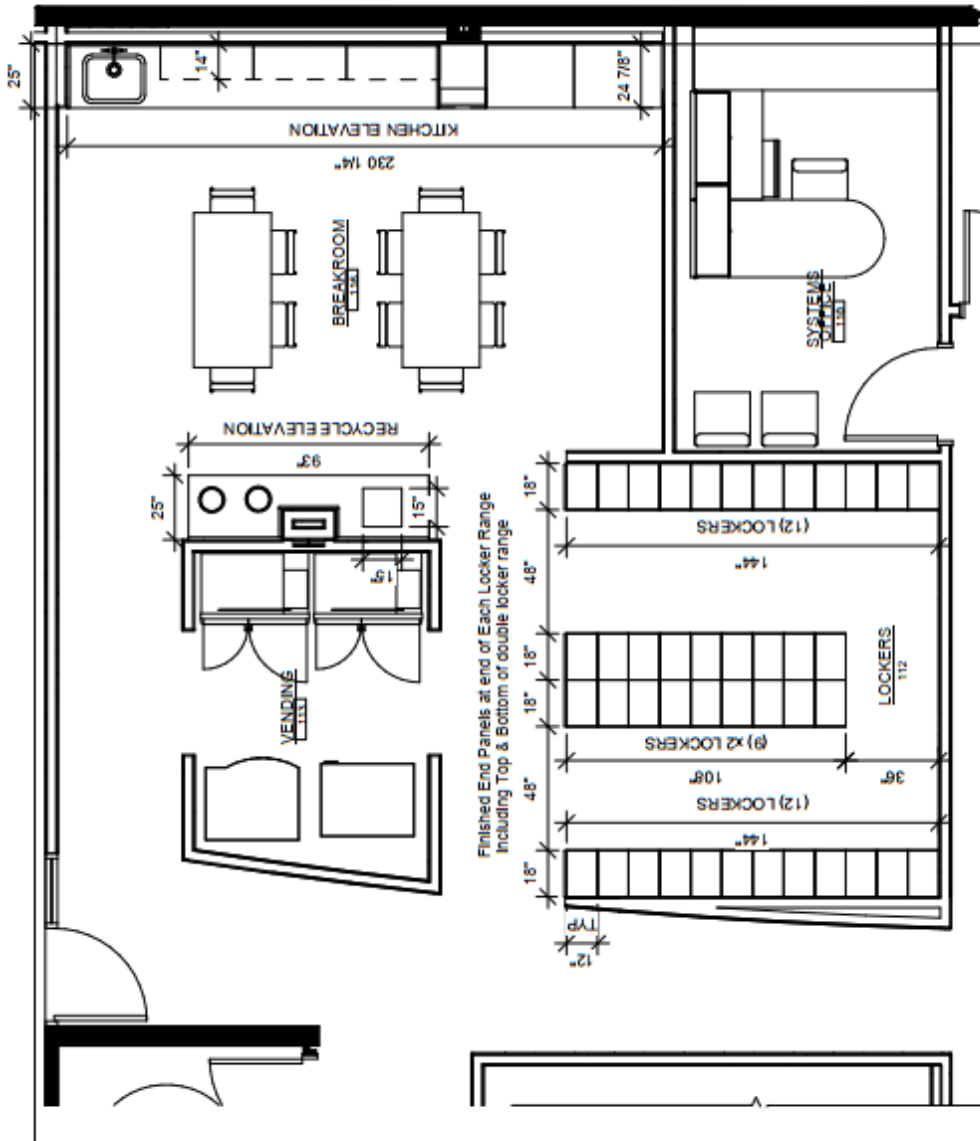
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ARCHITECT / DESIGNER	dancker	
DRAWN BY	S. TUTIVEN	
DATE	8/20/2020	SCALE 0 = 1/0"
PROJECT #	181545	DRAWING # D4

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① FLOOR PLAN  
1/4" = 1'-0"

UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
WESTFIELD, NJ

DISPATCH CENTER EXPANSION

ACCOUNT MGR	DENISE BOMBERG	
ARCHITECT / DESIGNER	dancker	
DRAWN BY	S. TUTIVEN	
DATE	8/20/2020	SCALE 0 = 10"
PROJECT #	181545	DRAWING # D5

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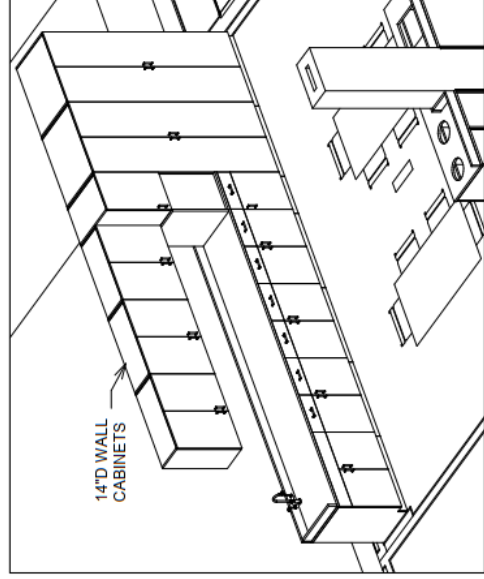


# Elkay EZH2O Bottle Filling Station Surface Mount Filtered Non-Refrigerated Stainless Model LZWSSM

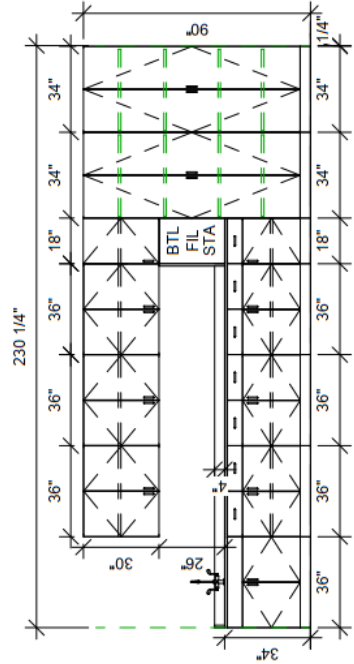
## PRODUCT SPECIFICATIONS

Elkay EZH2O Bottle Filling Station Surface Mount, Filtered Non-Refrigerated, Filtered, Green Ticker™, Laminar Flow, Antimicrobial, Real Mount, Electronic Bottle Filler Sensor activation. Product shall be Wall Mount (On Wall), for Indoor applications, serving 1 station(s). Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120. Unit shall be lead-free design which is certified to NSF/ANSI 61 & 372 (lead free) and meets Federal and State low-lead requirements.

<b>Special Features:</b>	Hands Free, Visual Filler Monitor, Filtered, Green Ticker™, Laminar Flow, Antimicrobial, Real Drain
<b>Finish:</b>	Stainless Steel
<b>Power:</b>	115V/60HZ
<b>Bubbler Style:</b>	No Bubbler
<b>Activation By:</b>	Electronic Bottle Filler Sensor
<b>Mounting Type:</b>	Wall Mount (On Wall)
<b>Chilling Option:</b>	Non-refrigerated
<b>Full Load Amps:</b>	1
<b>Rated Watts:</b>	15
<b>Dimensions (L x W x H):</b>	17-1/16" x 8-3/16" x 25-7/16"
<b>Approx. Shipping Weight:</b>	35 lbs.
<b>Installation Location:</b>	Indoor
<b>No. of Stations Served:</b>	1

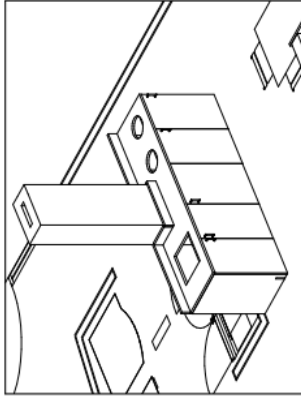


② KITCHEN COUNTER

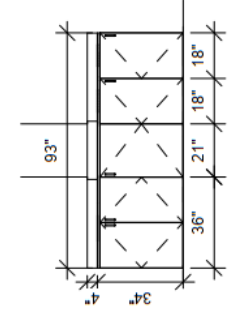


① KITCHEN COUNTER  
1/4" = 1'-0"

Stainless Steel Undermount Sink Provided by Others Sink  
Cutout Provide by Casework Mfr.  
Pantry Casework  
Solid Surface Tops Finish: Wilsonart Quartz Dinant Q4030  
with Cutouts as needed provided by Modular Casework Mfr.  
Casework Finish Wilsonart Designer White D354-01 Glossy Finish  
Hardware: Contemporary Stainless 6" Handle



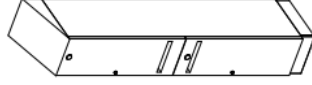
④ RECYCLE CABINETS



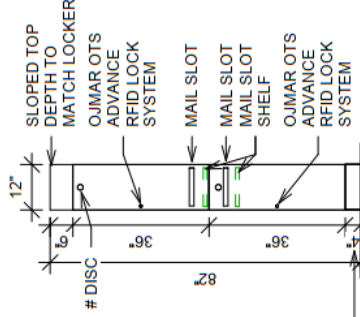
③ RECYCLE CABINETS  
1/4" = 1'-0"

Note: Recycling receptacles will be provided by casework Mfr.

Locker Finish:  
Wilsonart Designer White D354-01 Glossy Finish



⑥ TYPICAL LOCKER



Plywood Base with Trim to match locker finish supplied by Mfr.

⑤ TYPICAL LOCKER  
3/8" = 1'-0"

(2) SINGLE PRONG COAT HOOKS PER LOCKER

## UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
WESTFIELD, NJ

## DISPATCH CENTER EXPANSION

ACCOUNT MGR

DENISE BOMBERG

ARCHITECT / DESIGNER

dancker

DRAWN BY

S. TUTIVEN

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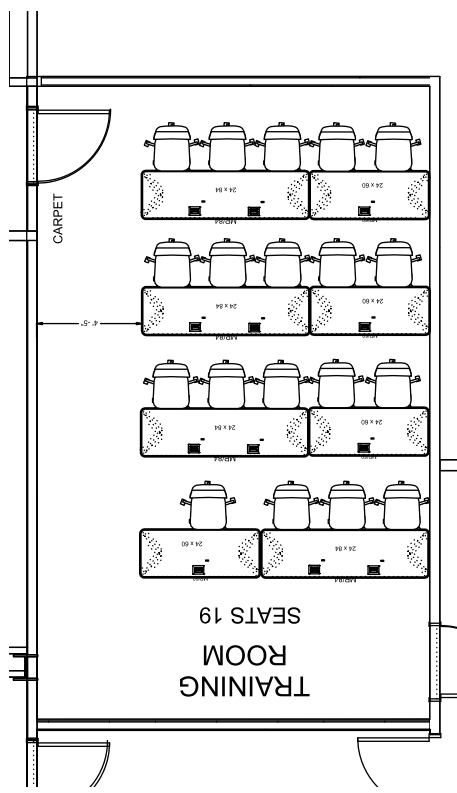
DATE	SCALE
8/20/2020	0 = 1'0"
PROJECT #	DRAWING #
181545	D6



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Description:  
 (4) 24 x 84 Groupworks Straight Table - fixed legs  
 (4) 24 x 60 Groupworks Straight Table - fixed legs  
 all tables include power unit

Finishes  
 Laminate: Arctic White LPL  
 Base: Metal Legs



Reply task chair  
 Mesh back, upholstered seat  
 Unique back handle for easy mobility  
 With/without arms  
 With/without adjustable lumbar support  
 Frame: Black  
 Arm tube: Black or Platinum  
 Base: Black, Platinum or Polished



**Reply**  
 seating

UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
 WESTFIELD, NJ

DISPATCH CENTER EXPANSION  
 PHASE 2  
 TRAINING ROOM

REVISION	DATE / BY	REVISION	DATE / BY
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ARCHITECT / DESIGNER <b>dancker</b>	DRAWING # <b>D7</b>
DRAWN BY <b>S.TUTIVEN</b>	PROJECT # <b>181545</b>
DATE <b>8/20/2020</b>	

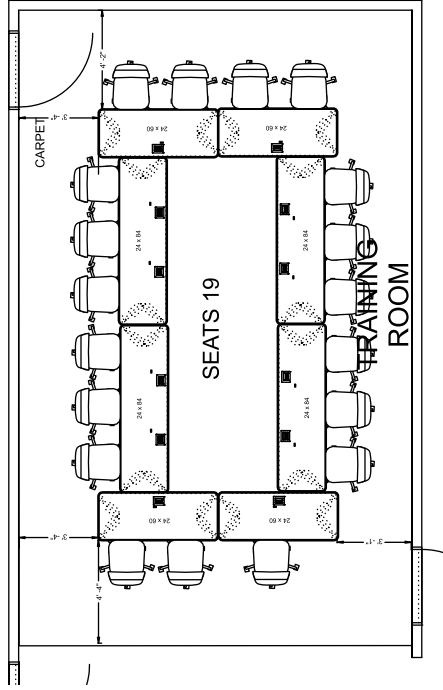


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Description:  
 (4) 24 x 84 Groupworks Straight Table -fixed legs  
 (4) 24 x 60 Groupworks Straight Table - fixed legs  
 all tables include power unit

Finishes  
 Laminate: Arctic White LPL  
 Base: Metal Legs



**Reply task chair**  
 Mesh back, upholstered seat  
 Unique back handle for easy mobility  
 With/without arms  
 With/without adjustable lumbar support  
 Frame: Black  
 Arm tube: Black or Platinum  
 Base: Black, Platinum or Polished



**Reply**  
 seating

UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
 WESTFIELD, NJ

DISPATCH CENTER EXPANSION  
 PHASE 2  
 TRAINING ROOM

REVISION	DATE / BY	REVISION	DATE / BY
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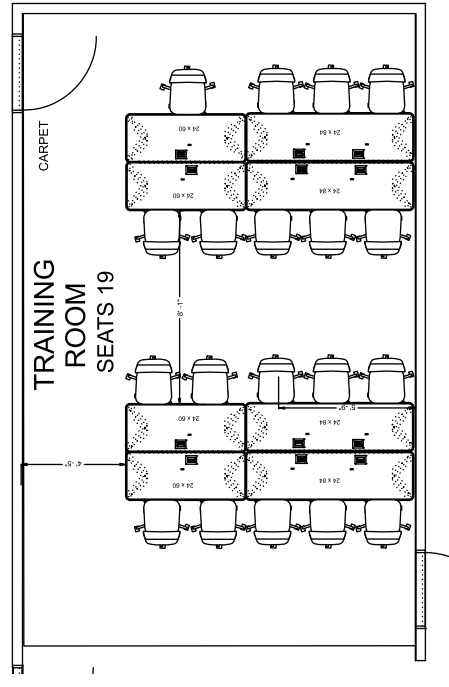
ACCOUNT MGR <b>DENISE BOMBERG</b>	SCALE <b>0 = 1/8"</b>
ARCHITECT / DESIGNER <b>dancker</b>	DRAWING # <b>D8</b>
DRAWN BY <b>S.TUTIVEN</b>	PROJECT # <b>181545</b>
DATE <b>8/20/2020</b>	



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**Description:**  
 (4) 24 x 84 Groupworks Straight Table -fixed legs  
 (4) 24 x 60 Groupworks Straight Table - fixed legs  
 all tables include power unit

**Finishes**  
 Laminate: Arctic White LPL  
 Base: Metal Legs



**Reply task chair**  
 Mesh back, upholstered seat  
 Unique back handle for easy mobility  
 With/without arms  
 With/without adjustable lumbar support  
 Frame: Black  
 Arm tube: Black or Platinum  
 Base: Black, Platinum or Polished



**Reply**  
 seating

UNION COUNTY DIV. OF ENGINEERING

NORTH AVE  
 WESTFIELD, NJ

DISPATCH CENTER EXPANSION  
 PHASE 2  
 TRAINING ROOM

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ACCOUNT MGR <b>DENISE BOMBERG</b>	SCALE <b>0 = 1/8"</b>
ARCHITECT / DESIGNER <b>dancker</b>	DRAWING # <b>D9</b>
DRAWN BY <b>S.TUTIVEN</b>	PROJECT # <b>181545</b>
DATE <b>8/20/2020</b>	



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**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

Issued for Bid Rev 1  
02/08/2021

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## SECTION 210513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION 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 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.

#### 1.3 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 NEMA MG 1 unless otherwise indicated.
- B. 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: 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. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F
- J. 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.
- K. 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.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

## 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 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.
  - 2. Sleeve-seal fittings.
  - 3. Grout.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
  - 1. Product Data: For sealants, indicating VOC content.
  - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

### **PART 2 - PRODUCTS**

#### **2.1 SLEEVES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. GPT; an EnPro Industries company.
- C. 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.



- D. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anticorrosion coated , with plain ends and integral welded waterstop collar.
- E. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
  - 1.

## **2.2 SLEEVE-SEAL FITTINGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. GPT; an EnPro Industries company.
  - 4. Metraflex Company (The).
  - 5. Proco Products, Inc.
- C. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.
- D. Plastic or rubber waterstop collar with center opening to match piping OD.

## **2.3 GROUT**

- A. Description: Nonshrink, 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.

## **2.4 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 C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; Dow Corning 758 Silicone Weather Barrier Sealant.

- b. GE Construction Sealants; Momentive Performance Materials Inc.; SSG4000AC UltraGlaze].
  - c. Polymeric Systems, Inc; PSI-641
  - d. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
  - e. Sherwin-Williams Company (The); White Lightning Silicone Ultra All Purpose Sealant.
2. Sealant shall have a VOC content of 250g/L or less.

### **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. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  2. 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.
  3. 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."
  - 1.

### **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-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. Use grout or silicone sealant, to seal the space around outside of sleeve-seal fittings.

### **3.4 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.

### **3.5 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 : Cast-iron pipe sleeves, Steel pipe sleeves, Sleeve-seal fittings.
    - b. Piping NPS 6 Insert pipe size and Larger: Cast-iron pipe sleeves, Steel pipe sleeves, Sleeve-seal fittings.
  - 2. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6 : Cast-iron pipe sleeves with sleeve-seal system, Steel pipe sleeves with sleeve-seal system, Sleeve-seal fittings.

- 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, 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.
3. Concrete Slabs-on-Grade:
  - a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system, Steel pipe sleeves with sleeve-seal system, Sleeve-seal fittings.
    - 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, Steel pipe sleeves with sleeve-seal system, Sleeve-seal fittings.
    - 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: Steel pipe sleeves, Sleeve-seal fittings.
  - 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 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. Escutcheons.
  - 2. Floor plates.

#### **1.3 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product 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. Mid-America Fittings, Inc.
  - 6. ProFlo; a Ferguson Enterprises, Inc. brand.

#### **2.2 ESCUTCHEONS**

- A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

- C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
- E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
- F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed 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. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
    - b. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
    - c. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
    - d. Bare Piping in Equipment Rooms: One-piece cast brass with 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: One-piece, floor plate.
  - 2. Existing Piping: Split floor plate.

**END OF SECTION 210518**

**SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION  
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. Two-piece ball valves with indicators.
  2. Bronze butterfly valves with indicators.
  3. Iron butterfly valves with indicators.
  4. Check valves.
  5. Bronze OS&Y gate valves.
  6. Iron OS&Y gate valves.
  7. Trim and drain valves.

**1.3 DEFINITIONS**

- A. NRS: Nonrising stem.
- B. OS&Y: Outside screw and yoke.
- C. SBR: Styrene-butadiene rubber.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of valve.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
  2. Protect threads, flange faces, and weld ends.
  3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:

1. Maintain valve end protection.
  2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
- D. Protect flanges and specialties from moisture and dirt.

## **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: VDG T - 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 TWO-PIECE BALL VALVES WITH INDICATORS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  1. Ames Fire & Waterworks; A WATTS Brand.
  2. NIBCO INC.
  3. Victaulic Company.
- B. Description:
  1. UL 1091, except with ball instead of disc and FM Global approved for indicating valves (butterfly or ball type), Class Number 1112.
  2. Minimum Pressure Rating: 175 psig.
  3. Body Design: Two piece.
  4. Body Material: Forged brass or bronze.
  5. Port Size: Full or standard.
  6. Seats: PTFE.
  7. Stem: Bronze or stainless steel.
  8. Ball: Chrome-plated brass.
  9. Actuator: Worm gear
  10. Supervisory Switch: Internal or external.
  11. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
  12. End Connections for Valves NPS 2-1/2: Grooved ends.

#### **2.4 BRONZE BUTTERFLY VALVES WITH INDICATORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ALEUM USA.
  2. Globe Fire Sprinkler Corporation.
  3. Milwaukee Valve Company.
- B. Description:
1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 1112.
  2. Minimum: Pressure rating: 175 psig.
  3. Body Material: Bronze.
  4. Seat Material: EPDM.
  5. Stem Material: Bronze or stainless steel.
  6. Disc: Bronze.
  7. Actuator: Worm gear.
  8. Supervisory Switch: Internal or external.
  9. Ends Connections for Valves NPS 1 through NPS 2: Threaded ends.
  10. Ends Connections for Valves NPS 2-1/2: Grooved ends.

#### **2.5 IRON BUTTERFLY VALVES WITH INDICATORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ALEUM USA.
  2. Anvil International.
  3. Globe Fire Sprinkler Corporation.
  4. Kennedy Valve Company; a division of McWane, Inc.
  5. NIBCO INC.
  6. Tyco by Johnson Controls Company.
  7. Victaulic Company.
  8. Zurn Industries, LLC.
- 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, nickel plated.
  7. Actuator: Worm gear.
  8. Supervisory Switch: Internal or external.
  9. Body Design: Grooved-end connections.

**2.6 CHECK VALVES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ames Fire & Waterworks; A WATTS Brand.
2. Anvil International.
3. FEBCO; A WATTS Brand.
4. Globe Fire Sprinkler Corporation.
5. Kennedy Valve Company; a division of McWane, Inc.
6. Mueller Co.
7. NIBCO INC.
8. Reliable Automatic Sprinkler Co., Inc. (The).
9. Tyco by Johnson Controls Company.
10. Victaulic Company.
11. Viking Corporation.
12. WATTS.
13. Zurn Industries, LLC.

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.
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.

**2.7 BRONZE OS&Y GATE VALVES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Milwaukee Valve Company.
2. NIBCO INC.
3. United Brass Works, Inc.
4. Zurn Industries, LLC.

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: Bronze or brass.
4. Wedge: One-piece bronze or brass.
5. Wedge Seat: Bronze.

6. Stem: Bronze or brass.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Threaded.

## **2.8 IRON OS&Y GATE VALVES**

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. Hammond Valve.
4. Kennedy Valve Company; a division of McWane, Inc.
5. Mueller Co.
6. NIBCO INC.
7. Victaulic Company.
8. WATTS.
9. Zurn Industries, LLC.

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: Flanged or Grooved.

## **2.9 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. Fire-End & Croker Corporation.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. Potter Roemer LLC; a Division of Morris Group International.
  - f. Tyco by Johnson Controls Company.
  - g. Victaulic Company.
  - h. WATTS.

- i. Zurn Industries, LLC.
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.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

#### **3.2 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.

- 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 AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND 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. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Fastener systems.

- B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

**1.3 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 for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.

- 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. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

## **1.5 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 **and obtain approval from authorities having jurisdiction.**
- 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.

### **2.3 METAL FRAMING SYSTEMS**

- A. MFMA Manufacturer Metal Framing Systems:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. B-line, an Eaton business.



- b. Flex-Strut Inc.
  - c. G-Strut.
  - d. Haydon Corporation.
  - e. Thomas & Betts Corporation; A Member of the ABB Group.
  - f. Unistrut; Part of Atkore International.
  - g. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
  3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
  4. Channels: Continuous slotted [carbon-steel] <Insert material> channel with inturned lips.
  5. Channel Width: Selected for applicable load criteria.
  6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
  7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
  8. Metallic Coating: Plain.
  9. Paint Coating: Green epoxy, acrylic, or urethane.
  10. .

**B. Non-MFMA Manufacturer Metal Framing Systems:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. CADDY; a brand of nVent.
  - c. Carpenter & Paterson, Inc.
  - d. Empire Industries, Inc.
  - e. PHD Manufacturing, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
8. Metallic Coating: Plain.
9. Paint Coating: Green epoxy, acrylic, or urethane.

**2.4 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.
- 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. B-line, an Eaton business.
    - b. Empire Tool and Manufacturing Co., Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - e. MKT Fastening, LLC.
  2. Indoor Applications: Zinc-coated.

## **2.5 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 INSTALLATION OF HANGERS AND SUPPORTS**

- 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal strut systems.
- 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. 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.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. 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.
- I. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. 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.
- K. 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. MSS SP-58, Type 39 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. MSS SP-58, Type 40 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 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- 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:
  1. 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.
    - a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
  2. Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting."
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

### **3.6 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 and attachments for general service applications.
- F. Use **stainless-steel** pipe hangers and **corrosion-resistant** attachments for hostile environment applications.

- G. Use thermal hanger-shield inserts for insulated piping and tubing.
- H. 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.
- I. 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.
- J. Hanger-Rod Attachments: Comply with NFPA requirements.
- K. 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.
- L. 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.

- M. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

**END OF SECTION 210529**

**SECTION 210548.13 - VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND 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. Pipe-riser resilient supports.
  - 2. Resilient pipe guides.
  - 3. Elastomeric hangers.
- B. Related Requirements:
  - 1. Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
  - 2. Section 230548.13 "Vibration Controls for HVAC" for devices for HVAC equipment and systems.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
  - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.
- B. Delegated-Design Submittal: For each vibration isolation device.
  - 1. Include design calculations for selecting vibration isolators.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show coordination of vibration isolation device installation for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For testing agency.



- C. Welding certificates.

## 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## PART 2 - PRODUCTS

### 2.1 PIPE-RISER RESILIENT SUPPORTS

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch thick neoprene.
  - 1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
  - 2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

### 2.2 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch thick neoprene.
  - 1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

### 2.3 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
  - 1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
  - 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

- A. Coordinate the 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."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 210548.13

## **SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND 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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Stencils.
  - 5. Valve tags.
  - 6. Warning tags.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- 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 and the proposed content for each label.
- D. Valve Schedules: Valve numbering scheme.

### **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:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
    - a. Brady Corporation.

- b. Brimar Industries, Inc.
  - c. Carlton Industries, LP.
  - d. Champion America.
  - e. Craftmark.
  - f. emedco.
  - g. Kolbi Pipe Marker Co.
  - h. LEM Products Inc.
  - i. Marking Services Inc.
  - j. Seton Identification Products.
3. Material and Thickness: Brass, 0.032 inchthick, with predrilled holes for attachment hardware.
  4. Letter Color: Black.
  5. Background Color: Yellow.
  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-fourths the size of principal lettering.
  8. Fasteners: Stainless-steel rivets.
  9. 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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  - a. Brady Corporation.
  - b. Brimar Industries, Inc.
  - c. Carlton Industries, LP.
  - d. Champion America.
  - e. Craftmark.
  - f. emedco.
  - g. Kolbi Pipe Marker Co.
  - h. LEM Products Inc.
  - i. Marking Services Inc.
  - j. Seton Identification Products.
3. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inchthick, with predrilled holes for attachment hardware.
4. Letter Color: Black.
5. Background Color: Yellow.
6. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
7. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

8. 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.
  9. Fasteners: Stainless-steel rivets.
  10. 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
1. Brady Corporation.
  2. Brimar Industries, Inc.
  3. Carlton Industries, LP.
  4. Champion America.
  5. Craftmark.
  6. emedco.
  7. LEM Products Inc.
  8. Marking Services Inc.
  9. National Marker Company.
  10. Seton Identification Products.
  11. Stranco, Inc.
- C. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
- D. Letter Color: Black.
- E. Background Color: Yellow.
- F. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- G. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

- H. 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.
- I. Fasteners: Stainless-steel rivets.
- J. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- K. 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product 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.
  - 7. emedco.
  - 8. Kolbi Pipe Marker Co.
  - 9. LEM Products Inc.
  - 10. Marking Services Inc.
  - 11. Seton Identification Products.
- C. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.
- D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- E. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- F. 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: Size letters according to ASME A13.1 for piping.
- G. Pipe-Label Colors:

1. Background Color: Safety Red.
2. Letter Color: White.

## **2.4 STENCILS**

### **A. Stencils for Piping:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  - a. Brimar Industries, Inc.
  - b. Carlton Industries, LP.
  - c. Champion America.
  - d. Craftmark.
  - e. Kolbi Pipe Marker Co.
  - f. Marking Services Inc.
3. Lettering Size: Size letters according to ASME A13.1 for piping.
4. Stencil Material: Aluminum.
5. Stencil Paint: Safety Red, exterior, gloss, alkyd enamel. Paint may be in pressurized spray-can form.
6. Identification Paint: White, exterior, alkyd enamel. Paint may be in pressurized spray-can form.

## **2.5 VALVE TAGS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  1. ActionCraft Products, Inc.
  2. Brady Corporation.
  3. Brimar Industries, Inc.
  4. Carlton Industries, LP.
  5. Champion America.
  6. Craftmark.
  7. emedco.
  8. Kolbi Pipe Marker Co.
  9. LEM Products Inc.
  10. Marking Services Inc.
  11. Seton Identification Products.

- C. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.032 inchthick, with predrilled holes for attachment hardware.
  - 2. Fasteners: Brass wire-link chain.
  - 3. Valve-Tag Color: Safety Red.
  - 4. Letter Color: White.
  
- D. 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.

## **2.6 WARNING TAGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  
- B. Basis-of-Design Product: Subject to compliance with requirements, provide roduct by one of the following:
  - 1. Brady Corporation.
  - 2. Brimar Industries, Inc.
  - 3. Carlton Industries, LP.
  - 4. Champion America.
  - 5. Craftmark.
  - 6. emedco.
  - 7. Kolbi Pipe Marker Co.
  - 8. LEM Products Inc.
  - 9. Marking Services Inc.
  - 10. Seton Identification Products.
  
- C. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
  - 1. Size: 3 by 5-1/4 inches minimum.
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 4. Color: Safety Yellow background with black lettering.



**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 GENERAL 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 identifying devices before installing acoustical ceilings and similar concealment.

**3.3 EQUIPMENT LABEL INSTALLATION**

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

**3.4 PIPE LABEL INSTALLATION**

- A. Piping: Painting of piping is specified in Section 099123 "Interior Painting.
- B. Stenciled Pipe-Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- C. 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 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.

**3.5 VALVE-TAG INSTALLATION**

- A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
  - 1. Valve-Tag Size and Shape:
    - a. Fire-Suppression Standpipe: 1-1/2 inches round.
    - b. Wet-Pipe Sprinkler System: 1-1/2 inches round.

**3.6 WARNING-TAG INSTALLATION**

- A. Write required message on, and attach warning tags to, equipment and other items where required.

**END OF SECTION 210553**

## **SECTION 211313 - WET-PIPE SPRINKLER 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. Pipes, fittings, and specialties.
  - 2. Sprinklers.
  - 3. Alarm devices.
  - 4. Control panels.
  - 5. Pressure gauges.
- B. Related Requirements:
  - 1. Section 211100 "Facility Fire-Suppression Water-Service Piping" for fire water service backflow prevention devices.
  - 2. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
  - 3. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

#### **1.3 DEFINITIONS**

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

#### **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.
- B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
  2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For wet-pipe sprinkler systems.
1. Include plans, elevations, sections, and attachment details.
  2. Include diagrams for power, signal, and control wiring.
- D. 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.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Sprinkler systems, or BIM model, drawn to scale, on which the following items 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. Welding certificates.
- E. Field Test Reports:
1. 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."
  2. Fire-hydrant flow test report.
- F. Field quality-control reports.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and 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.

## **1.8 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.

### **B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.**

## **1.9 FIELD CONDITIONS**

- ### **A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:**
1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
  2. Do not proceed with interruption of sprinkler service without Owner's written permission.

## **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. High-Pressure Piping System Component: Listed for 250-psig minimum working pressure.
  1. 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) Laundries: Ordinary Hazard, Group 1.
  - 6) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
  - 7) Residential Living Areas: Light Hazard.
2. Minimum Density for Automatic-Sprinkler Piping Design:
    - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft..
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.area.
    - c.
  3. Maximum protection area per sprinkler according to UL listing.
  4. Maximum Protection Area per Sprinkler:
    - a. Residential Areas: 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

## **2.2 STEEL PIPE AND FITTINGS**

- A. Standard-Weight, BlackSteel Pipe: ASTM A53/A53M, Type E. Pipe ends may be factory or field formed to match joining method.
- B. 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.
- C. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
  1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
  2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- D. 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-Apollo Piping Products USA Inc.
    - e. Smith-Cooper International.
    - f. Tyco by Johnson Controls Company.
    - g. Victaulic Company.
  2. Pressure Rating: 175-psigminimum.

3. 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.

## **2.3 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.
  1. Adhesive primer shall have a VOC content of 550 g/L or less.
  2. Adhesive primer shall comply 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."
  3. "

## **2.4 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. Shurjoint-Apollo Piping Products USA Inc.
    - e. Tyco by Johnson Controls Company.
    - f. Victaulic Company.
  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. Tyco by Johnson Controls Company.
  - d. Victaulic Company.
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 the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, 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.
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. Triple R Specialty.
  - c. Tyco by Johnson Controls Company.
  - d. Victaulic Company.
  - e. Viking Corporation.
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.
  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.
  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.

## **2.5 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. Viking Corporation.
- 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. Early-Suppression, Fast-Response Applications: UL 1767.
  2. Residential Applications: UL 1626.
  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.
- G. Sprinkler Finishes: Chrome plated-painted.
- 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: Plastic, white finish, one piece, flat.
  2. Sidewall Mounting: Plastic, white finish, 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.
  2. Standard: UL 199.
  3. Type: Wire cage with fastening device for attaching to sprinkler.

## **2.6 ALARM DEVICES**

- A. Alarm-device types shall match piping and equipment connections.
- 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.
2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 8-1/2-inches 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 Notification Appliances:

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.
2. Electric Bell:
  - a. Standard: UL 464.
  - b. Type: Vibrating, metal alarm bell.
  - c. Size: 6-inch minimum-diameter.
  - d. Voltage: 120 V ac, 60 Hz, 1 phase or 24 V dc.
  - e. Finish: Red-enamel or polyester powder-coat factory finish, suitable for outdoor use with approved and listed weatherproof backbox.
3. Strobe/Horn:
  - a. Standard: UL 464.
  - b. Tone: Selectable, steady, Temporal-3 (T-3) in accordance with ISO 8201 and ANSI/ASA S3.41, 2400 Hz, electromechanical, broadband.
  - c. Voltage: 120 V ac, 60 Hz.
  - d. Effective Intensity: 110 cd.
  - e. Finish: Red, suitable for outdoor use with approved and listed weatherproof backbox. White letters on housing identifying device as for "Fire."
  - f. Sign, Integrated: Mount between backbox and strobe/horn with text visible on both sides, above and below strobe/horn. Housing to be shaped to cover surface-mounted weatherproof backbox. Sign is to consist of white lettering on red plastic identifying it as a "Sprinkler Fire Alarm" and instructing viewers to call 911, police, or fire department.

D. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ADT Security Services, Inc.
  - b. McDonnell & Miller.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
  - e. Viking Corporation.
  - f. WATTS.
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. Barksdale, Inc.
  - b. Detroit Switch, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
  - e. Tyco by Johnson Controls Company.
  - f. United Electric Controls Co.
  - g. Viking Corporation.
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.
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.
6. 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.

## **2.7 CONTROL PANELS**

- A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
  2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
  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.
- B. Panels Components:
1. Power supply.
  2. Battery charger.
  3. Standby batteries.
  4. Field-wiring terminal strip.
  5. Electrically supervised solenoid valves and polarized fire-alarm bell.
  6. Lamp test facility.
  7. Single-pole, double-throw auxiliary alarm contacts.
  8. Rectifier.

## **2.8 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.
- 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 PREPARATION**

- A. Perform fire-hydrant flow test according to NFPA 13 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 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.
- C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

**3.3 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.
- 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 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."

### **3.5 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 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 and Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- 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. 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.
- L. 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.
- M. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.



- N. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- O. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- P. 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.
- Q. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- R. 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.

### **3.6 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.

### **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 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 or 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. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
  - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  - 2. Schedule 40, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
  - 3. Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. 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 cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  - 3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.
  - 4. 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.
  - 5. Schedule 10 black-steel pipe with plain ends; welding fittings; and welded 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: Pendent sprinklers, Recessed sprinklers, Flush sprinklers, Concealed sprinklers
  3. Wall Mounting: Sidewall sprinklers.
- B. 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. Residential Sprinklers: Dull chrome.
  5. 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 211313**

## **SECTION 211316 - DRY-PIPE SPRINKLER 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. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

- 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.

#### **1.3 DEFINITIONS**

- A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

#### **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.

- 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.

#### 1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Compressed air piping.
3. HVAC hydronic piping.
4. Items penetrating finished ceiling including the following:
  - a. Lighting fixtures.
  - b. Air outlets and inlets.

B. Qualification Data: For qualified Installer and professional engineer.

C. 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. 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 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

F. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and 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. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of

sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

## 1.8 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.

## 1.9 FIELD CONDITIONS

- ### A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify Construction Manager or Owner no fewer than two days in advance of proposed interruption of sprinkler service.
  2. Do not proceed with interruption of sprinkler service without Construction Manager's or Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTIONS

- #### A. Single-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of fire-detection system, located in same area as sprinklers, opens deluge valve, permitting water to flow into sprinkler piping and to discharge from opened sprinklers.

### 2.2 PERFORMANCE REQUIREMENTS

- #### A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. NFPA 13.
  2. NFPA 13R.
- #### B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

- C. 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:
- D. 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. Storage Areas: Ordinary Hazard, Group 2
    - b. 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..
    - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
    - d. Special Occupancy Hazard: As determined by authorities having jurisdiction.
  - 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.
    - c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

### 2.3 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, Galvanized-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, 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 A 135/A 135M or ASTM A 795/A 795M, 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 A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- E. Galvanized-Steel Couplings: ASTM A 865/A 865M, 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.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
  - 1. Pressure Rating: 175-psig minimum.
  - 2. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
  - 3. 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 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
  - 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free].
- F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- G. Copper Pressure-Seal Fittings:
  - 1. Standard: UL 213.
  - 2. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.



3. NPS 2-1/2 to NPS 4: Cast-bronze fitting with EPDM-rubber O-ring seal in each end.

H. Grooved-Joint, Copper-Tube Appurtenances:

1. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584 bronze castings.
2. Grooved-End-Tube Couplings: To fit copper-tube dimensions, with design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.

I. Copper-Tube, Extruded-Tee Connections:

1. Description: Tee formed in copper tube according to ASTM F 2014.

2.5 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 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. Standard: UL 260.
2. Design: Differential-pressure type.
3. 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.
4. Air-Pressure Maintenance Device: Standard: UL 260.
5. Type: Automatic device to maintain minimum air pressure in piping.
6. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig pressure.
7. Air Compressor:
  - a. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  - b. Motor Horsepower: Fractional.
  - c. Power: 120-V ac, 60 Hz, single phase.

G. Deluge Valves:

1. Standard: UL 260.
2. Design: Hydraulically operated, differential-pressure type.

3. Include trim sets for alarm-test bypass, drain, electrical water-flow alarm switch, pressure gages, drip cup assembly piped without valves and separate from main drain line, and fill-line attachment with strainer.
4. Dry, Pilot-Line Trim Set: Include dry, pilot-line actuator; air- and water-pressure gages; low-air-pressure warning switch; air relief valve; and actuation device. Dry, pilot-line actuator includes cast-iron, operated, diaphragm-type valve with resilient facing plate, resilient diaphragm, and replaceable bronze seat. Valve includes threaded water and air inlets and water outlet. Loss of air pressure on dry, pilot-line side allows pilot-line actuator to open and causes deluge valve to open immediately.
5. Air-Pressure Maintenance Device:
  - a. Standard: UL 260.
  - b. Type: Automatic device to maintain minimum air pressure in piping.
  - c. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
6. Air Compressor:
  7. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  8. Motor Horsepower: Fractional.
  9. Power: 120-V ac, 60 Hz, single phase.
  10. 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

- H. 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.

## 2.6 SPRINKLER PIPING SPECIALTIES

- A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.
- B. Branch Outlet Fittings:
1. Standard: UL 213.
  2. Pressure Rating: 175-psig minimum.
  3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
  4. Type: Mechanical-tee and -cross fittings.
  5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
  6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
  7. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Flow Detection and Test Assemblies:
1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

2. Pressure Rating: 175-psig minimum.
  3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
  4. Size: Same as connected piping.
  5. Inlet and Outlet: Threaded.
- D. Branch Line Testers:
1. Standard: UL 199.
  2. Pressure Rating: 175-psig minimum.
  3. Body Material: Brass.
  4. Size: Same as connected piping.
  5. Inlet: Threaded.
  6. Drain Outlet: Threaded and capped.
  7. Branch Outlet: Threaded, for sprinkler.
- E. Sprinkler Inspector's Test Fittings:
1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  2. Pressure Rating: 175-psig minimum.
  3. Body Material: Cast- or ductile-iron housing with sight glass.
  4. Size: Same as connected piping.
  5. Inlet and Outlet: Threaded.
- F. Adjustable Drop Nipples:
1. Standard: UL 1474.
  2. Pressure Rating: 250-psig minimum.
  3. Body Material: Steel pipe with EPDM O-ring seals.
  4. Size: Same as connected piping.
  5. Length: Adjustable.
  6. Inlet and Outlet: Threaded.
- G. Flexible Sprinkler Hose Fittings:
1. Standard: UL 1474.
  2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
  3. Pressure Rating: 175-psig minimum.
  4. Size: Same as connected piping, for sprinkler.
- 2.7 SPRINKLERS
- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Pressure Rating for High-Pressure Automatic Sprinklers: 250-psig minimum.
- E. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Residential Applications: UL 1626.
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: Chrome plated, bronze and painted.

G. Special Coatings: Wax, lead and corrosion-resistant paint.

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. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

## 2.8 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Standard: UL 753.
2. Type: Mechanically operated, with Pelton wheel.
3. Alarm Gong: Cast aluminum with red-enamel factory finish.
4. Size: 10-inch diameter.
5. Components: Shaft length, bearings, and sleeve to suit wall construction.
6. Inlet: NPS 3/4.
7. Outlet: NPS 1 drain connection.

C. Electrically Operated Alarm Bell:

1. Standard: UL 464.
2. Type: Vibrating, metal alarm bell.
3. Size: 6-inch minimum diameter.
4. Finish: Red-enamel factory finish, suitable for outdoor use.
5. 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. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

- E. Valve Supervisory Switches:
  - 1. Standard: UL 346.
  - 2. Type: Electrically supervised.
  - 3. Components: Single-pole, double-throw switch with normally closed contacts.
  - 4. Design: Signals that controlled valve is in other than fully open position.
  - 5. 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

## 2.9 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.

## 2.10 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
  - 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
  - 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
  - 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
- B. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panels Components:
  - 1. Power supply.
  - 2. Battery charger.
  - 3. Standby batteries.
  - 4. Field-wiring terminal strip.
  - 5. Electrically supervised solenoid valves and polarized fire-alarm bell.
  - 6. Lamp test facility.
  - 7. Single-pole, double-throw auxiliary alarm contacts.
  - 8. Rectifier.

2.11 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig.
- D. Label: Include "WATER" or "AIR/WATER" label on dial face.
- E. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 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 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 gage, 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 gage, and drain at connection to water service.

3.3 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 gage, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, 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 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 gages 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 gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- P. Drain dry-pipe sprinkler piping.
- Q. Pressurize and check dry-pipe sprinkler system piping and air-pressure maintenance devices or/and air compressors.
- R. 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."
- S. 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."
- T. 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 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. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- K. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- L. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. 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.
- N. 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 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 gages, priming chamber attachment, and fill-line attachment.
    - a. Install air compressor and compressed-air-supply piping.
    - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.

- c. Install compressed-air-supply piping from building's compressed-air piping system.

### 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 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.

3.10 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 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 threaded ends, cast-iron threaded fittings, and threaded, 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. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- D. Standard-pressure, dry-pipe sprinkler system, NPS 2 and smaller 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 plain ends; plain-end-pipe fittings; and twist-locked joints.
  - 3. Standard-weight or Schedule 30, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- E. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 4 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 cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.13 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 recessed sprinklers, Dry flush sprinklers, Dry concealed sprinklers, Dry pendent, recessed, flush, and concealed sprinklers as indicated.
  3. Wall Mounting: Dry sidewall sprinklers.
  4. Spaces Subject to Freezing: Upright sprinklers, Dry pendent sprinklers, Dry sidewall sprinklers, Upright, dry pendent sprinklers; and dry sidewall sprinklers as indicated.
  5. Special Applications: Extended-coverage and quick-response sprinklers where indicated.
- 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 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. Piping and piping specialties.
  - 2. Extinguishing-agent containers.
  - 3. Extinguishing agent.
  - 4. Detection and alarm devices.
  - 5. Control and alarm panels.
  - 6. Accessories.
  - 7. Connection devices for and wiring between system components.
  - 8. Connection devices for power and integration into building's fire-alarm system.

#### **1.3 DEFINITIONS**

- A. ATS: Acceptance Testing Specifications.
- B. EPO: Emergency Power Off.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
- C. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include design calculations.
  - 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 4. Wiring Diagrams: For power, signal, and control wiring.

- D. Delegated-Design Submittal: For clean-agent fire-extinguishing system signed and sealed by the qualified professional engineer.
1. Indicate compliance with performance requirements and design criteria, including analysis data.
  2. Include design calculations for weight, volume, and concentration of extinguishing agent required for each hazard area.
  3. Indicate the Following on Reflected Ceiling Plans:
    - a. Ceiling penetrations and ceiling-mounted items.
    - b. Extinguishing-agent containers if mounted above floor, piping and discharge nozzles, detectors, and accessories.
    - c. Method of attaching hangers to building structure.
    - d. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
  4. Indicate the Following on Occupied Work Area Plans:
    - a. Controls and alarms.
    - b. Extinguishing-agent containers, piping and discharge nozzles if mounted in space, detectors, and accessories.
    - c. Equipment and furnishings.
  5. Indicate the Following on Access Floor Space Plans:
    - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
    - b. Method of supporting piping.
  6. Indicate the Following on Ceiling Plans:
    - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
    - b. Method of supporting piping.
    - c. Other equipment located in the ceiling space that is being protected including sprinkler piping, HVAC equipment, raceways, or conduit.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
1. Domestic water piping.
  2. Items Penetrating Finished Ceiling Include the Following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.

- B. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.
- C. Seismic Qualification Certificates: For extinguishing-agent containers and control panels 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. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For special agent system to include in emergency, operation, and 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. Deliver extra materials to Owner.
  - 1. Detection Devices: Not less than 20 percent of amount of each type installed.
  - 2. Container Valves: Not less than 10 percent of amount of each size and type installed.
  - 3. Nozzles: Not less than 20 percent of amount of each type installed.
  - 4. Extinguishing Agent: Not less than 100 percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

#### 1.8 QUALITY ASSURANCE

- 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. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

2.1 CLEAN-AGENT SYSTEMS

- A. 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.
- B. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
- C. 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.
- D. 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 other zone.
- E. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.
- F. 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. On agent discharge, release preaction valve to allow water to fill sprinkler system.
  - 3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.
- G. 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, and release preaction valve to allow water flow to sprinkler system.
  - d. Fourth Detection Level (Fire 2): Same as Fire 1.

- H. Manual stations shall immediately discharge extinguishing agent when activated.
- I. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.
- J. EPO: Will terminate power to protected equipment immediately on actuation.
- K. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.
- L. Power Transfer Switch: Transfer from normal to stand-by power source.
- M. Seismic Performance: Fire-suppression piping and containers 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."

## 2.2 PIPING MATERIALS

- A. See "HFC 227ea Agent Piping Applications FK-5-1-12 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.

2.3 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106/A 106M, 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 A 47/A 47M malleable iron or ASTM A 536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
- 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.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- D. 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.
- E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, 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 or Manufacturer's standard color, 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.

2.7 DISCHARGE NOZZLES

- A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

2.8 MANIFOLD AND ORIFICE UNIONS

- A. Description: NRTL-listed device with minimum 2175-psig pressure rating, to control flow and reduce pressure of IG-541 gas in piping.
  - 1. NPS 2 and Smaller: Piping assembly with orifice, sized for system design requirements.
  - 2. NPS 2-1/2 and Larger: Piping assembly with nipple, sized for system design requirements.

2.9 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 or Surface.
- D. Supervised Circuits: Separate circuits for each independent hazard area.

1. Detection circuits equal to the required number of zones, or addressable devices assigned to the 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.

## 2.10 DETECTION DEVICES

A. General Requirements for Detection Devices:

1. Comply with NFPA 2001, NFPA 72, and UL 268.
2. 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. Remote Air-Sampling Detector System: Includes air-sampling pipe network, a laser-based photoelectric detector, a sample transport fan, and a control unit.

1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of 0.05-inch wg at all sampling ports.

4. Control Unit: Multizone unit as indicated on Drawings. Provides same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.

E. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones.

## 2.11 MANUAL STATIONS

A. General Description: Surface or Semirecessed 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.

## 2.12 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 the door operator to drive the door closed.

## 2.13 ALARM DEVICES

A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System" 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.

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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

3.3 CLEAN-AGENT PIPING INSTALLATION

- A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.
- B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.
- C. Install extinguishing-agent containers anchored to substrate.
- D. Install pipe and fittings, valves, and discharge nozzles according to 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 according to NFPA 13.
  - 3. Install seismic restraints for extinguishing-agent containers and piping systems.
  - 4. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

- C. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System."

### 3.5 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify piping, extinguishing-agent containers, other equipment, and panels according to 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 the horn(s), bell(s), and strobe light(s) outside the protected space.

### 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. Tests and Inspections:
  - 1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
  - 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. Remove malfunctioning units, replace with new units, and retest.
  - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Units will be considered defective if they do not pass tests and inspections.

- F. Prepare test and inspection reports.

### 3.7 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.

### 3.8 SYSTEM FILLING

- A. Preparation:

1. Verify that piping system installation is completed and cleaned.
2. Check for complete enclosure integrity.
3. Check operation of ventilation and exhaust systems.

- B. Filling Procedures:

1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled extinguishing-agent containers.
3. Energize circuits.
4. Adjust operating controls.

### 3.9 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



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**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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## **SECTION 220516 - EXPANSION FITTINGS AND LOOPS 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. Grooved-joint expansion joints.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
  - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
  - 3. Alignment Guide Details: Detail field assembly and attachment to building structure.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For expansion joints to include in maintenance manuals.

#### **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## **PART 2 - PRODUCTS**

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

### **2.2 GROOVED-JOINT EXPANSION JOINTS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Anvil International.
  - 2. Shurjoint-Apollo Piping Products USA Inc.
  - 3. Victaulic Company.
- B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
- C. Standard: AWWA C606, for grooved joints.
- D. Nipples: ASTM A53/A53M, Schedule 40, Type E or S, steel pipe with grooved ends.
- E. Couplings: Fiveflexible type for steel-pipe dimensions. Include ferrous housing sections and bolts and nuts.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF EXPANSION JOINTS**

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
- C. Install grooved-joint expansion joints to grooved-end steel piping.

**|END OF SECTION 22016**

## **SECTION 220517 - SLEEVES AND SLEEVE SEALS 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. Sleeves.
  - 2. Stack-sleeve fittings.
  - 3. Sleeve-seal systems.
  - 4. Sleeve-seal fittings.
  - 5. Grout.
  - 6. Silicone sealants.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
  - 1. Product Data: For sealants, indicating VOC content.
  - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

#### **1.4 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Advance Products & Systems, Inc.
  2. CALPICO, Inc.
  3. GPT; an EnPro Industries company.
- C. 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 collar.
- D. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anticorrosion coated, with plain ends and integral welded waterstop collar.
- E. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

## **2.2 STACK-SLEEVE FITTINGS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
1. Jay R. Smith Mfg. Co.
  2. Zurn Industries, LLC.
- C. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

## **2.3 SLEEVE-SEAL SYSTEMS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name, product name or designation> or comparable product by one of the following:
1. Advance Products & Systems, Inc.
  2. CALPICO, Inc.
  3. GPT; an EnPro Industries company.
  4. Metraflex Company (The).
  5. Proco Products, Inc.
- C. 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. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633.

## **2.4 SLEEVE-SEAL FITTINGS**

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  1. Advance Products & Systems, Inc.
  2. CALPICO, Inc.
  3. GPT; an EnPro Industries company.
  4. Metraflex Company (The).
  5. Proco Products, Inc.
- C. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.
- D. Plastic or rubber waterstop collar with center opening to match piping OD.

## **2.5 GROUT**

- A. Description: Nonshrink, 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.

## **2.6 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 C 920, Type S, Grade NS, Class 25, Use NT.
  1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

- a. Dow Corning Corporation; Dow Corning 758 Silicone Weather Barrier Sealant.
  - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2350.
  - c. Polymeric Systems, Inc; PSI-631.
  - d. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
  - e. Sherwin-Williams Company (The); White Lightning Silicone Ultra All Purpose Sealant.
2. Sealant shall have a VOC content of 250g/L or less.

### **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. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  2. 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.
- 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 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 076200 "Sheet Metal Flashing and Trim."
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. Use silicone sealant to seal the space around outside of stack-sleeve fittings.

- B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### **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. Use grout or silicone sealant to seal the space around outside of sleeve-seal fittings.

### **3.5 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.

### **3.6 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 pipe sleeves, Steel pipe sleeves or Sleeve-seal fittings.
  - b. Piping NPS 6 and Larger: Cast-iron pipe sleeves, Steel pipe sleeves or Sleeve-seal fittings.
2. Exterior Concrete Walls below Grade:
  - a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system, Steel pipe sleeves with sleeve-seal system or Sleeve-seal fittings .
    - 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, Steel pipe sleeves with sleeve-seal system or Sleeve-seal fittings.
    - 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, Steel pipe sleeves with sleeve-seal system or Sleeve-seal fittings.
    - 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, Steel pipe sleeves with sleeve-seal system or Sleeve-seal fittings.
    - 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: 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.

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**END OF SECTION 220517**

## **SECTION 220518 - ESCUTCHEONS 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. Escutcheons.
  - 2. Floor plates.

#### **1.3 DEFINITIONS**

- A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

#### **1.4 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product 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. Mid-America Fittings, Inc.
  - 6. ProFlo; a Ferguson Enterprises, Inc. brand.

## **2.2 ESCUTCHEONS**

- A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

## **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 finish.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel 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 in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
    - g. Bare Piping in Equipment Rooms: One-piece steel 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 : One-piece, floor plate.
  - 2. Existing Piping: Split floor plate.

**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. Dial-type pressure gages.
- B. Related Requirements:
  - 1. Section 221113 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.

#### **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:

- B. Basis-of-Design Product: Subject to compliance with requirements, provide e product by one of the following:
  - 1. Ashcroft Inc.
  - 2. Ernst Flow Industries.
  - 3. Marsh Bellofram.
  - 4. Miljoco Corporation.
  - 5. Nanmac Corporation.
  - 6. Noshok.
  - 7. Palmer Wahl Instrumentation Group.
  - 8. Terrice, H. O. Co.
  - 9. Watts; a Watts Water Technologies company.
  - 10. Weiss Instruments, Inc.
- C. Standard: ASME B40.200.
- D. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.
- E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F .
- F. Connector Type(s): Union joint, adjustable angle , with unified-inch screw threads.
- G. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- H. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- I. Window: Plain glass.
- J. Ring: Stainless steel.
- K. Element: Bimetal coil.
- L. Pointer: Dark-colored metal.
- M. Accuracy: Plus or minus 1 percent of scale range.

## **2.2 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:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
    - a. Ametek U.S. Gauge.
    - b. Ashcroft Inc.
    - c. Ernst Flow Industries.
    - d. Flo Fab Inc.

- e. Marsh Bellofram.
  - f. Miljoco Corporation.
  - g. Noshok.
  - h. Palmer Wahl Instrumentation Group.
  - i. Trerice, H. O. Co.
  - j. Watts; a Watts Water Technologies company.
  - k. Weiss Instruments, Inc.
- 
- 3. Standard: ASME B40.100.
  - 4. Case: Sealed; cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
  - 5. Pressure Connection: Brass, with NPS 1/4, 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.

### **2.3 TEST PLUGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  - 1. Flow Design, Inc.
  - 2. Trerice, H. O. Co.
  - 3. Watts; a Watts Water Technologies company.
  - 4. Weiss Instruments, Inc.
- C. Description: Test-station fitting made for insertion into piping tee fitting.
- D. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- E. Thread Size: NPS 1/4, ASME B1.20.1 pipe thread.
- F. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
- G. Core Inserts: Chlorosulfonated polyethylene synthetic self-sealing rubber.



### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install thermowells with socket extending a minimum of 2 inches into fluid 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 test plugs in piping tees.
- K. 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.
- L. 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.

#### **3.2 CONNECTIONS**

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

**3.3 ADJUSTING**

- A. Adjust faces of meters and gages to proper angle for best visibility.

**3.4 THERMOMETER SCHEDULE**

- A. Thermometers at inlet and outlet of each domestic water heater shall be the following:

- 1. Sealed, bimetallic-actuated type.

- B. Thermometer stems shall be of length to match thermowell insertion length.

**3.5 THERMOMETER SCALE-RANGE SCHEDULE**

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.
- B.

**3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE**

- A. Scale Range for Water Service Piping: 0 to 200 psi .Scale Range for Domestic Water Piping: 0 to 200 psi .

**END OF SECTION 220519**

## **SECTION 220523.12 - BALL VALVES 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. Bronze ball valves.
  - 2. Iron ball valves.
  - 3. CPVC ball valves.

#### **1.3 DEFINITIONS**

- A. CWP: Cold working pressure.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of valve.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and soldered ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

## **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 B16.5 for flanges on steel valves.
  - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B16.18 for solder-joint connections.
  - 6. 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 BRONZE BALL VALVES**

- A. Bronze Ball Valves, One-Piece with Bronze Trim:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. FNW; Ferguson Enterprises, Inc.
    - c. NIBCO INC.

- d. WATTS.
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, One-Piece with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. NIBCO INC.
    - c. WATTS.
  2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig.
    - c. Body Design: One piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Reduced.
- C. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. Crane; Crane Energy Flow Solutions.
    - c. FNW; Ferguson Enterprises, Inc.
    - d. Hammond Valve.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. WATTS.
    - h. Zurn Industries, LLC.

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.

D. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Press Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Flow Controls; Conbraco Industries, Inc.
  - b. Crane; Crane Energy Flow Solutions.
  - c. Hammond Valve.
  - d. Milwaukee Valve Company.
  - e. NIBCO INC.
  - f. WATTS.
  - g. Zurn Industries, LLC.
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.

E. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Flow Controls; Conbraco Industries, Inc.
  - b. Hammond Valve.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. WATTS.

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.

F. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Flow Controls; Conbraco Industries, Inc.
  - b. Hammond Valve.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. WATTS.
2. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig.
  - c. Body Design: Three piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded.
  - f. Seats: PTFE.
  - g. Stem: Bronze or brass.
  - h. Ball: Chrome-plated brass.
  - i. Port: Full.

### **2.3 IRON BALL VALVES**

A. Iron Ball Valves, 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. WATTS.
  - d. Zurn Industries, LLC.
2. Description:

- a. Standard: MSS SP-72.
- b. CWP Rating: 200 psig.
- c. Body Design: Split body.
- d. Body Material: ASTM A 126, gray iron.
- e. Ends: Flanged or threaded.
- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel.
- i. Port: Full.

## **2.4 CPVC BALL VALVES**

### **A. CPVC Union Ball Valves:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Valve, Inc.
  - b. Asahi/America.
  - c. Georg Fischer Inc.
  - d. Hayward Flow Control.
  - e. IPEX USA LLC.
  - f. NIBCO INC.
  - g. Spears Manufacturing Company.
  - h. Thermoplastic Valves, Inc.
2. Description:
  - a. Standard: MSS SP-122.
  - b. Pressure Rating and Temperature: 150 psig 73 deg F.
  - c. Body Material: CPVC.
  - d. Body Design: Union type.
  - e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
  - f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket, threaded or flanged.
  - g. Ball: CPVC; full port.
  - h. Seals: PTFE or EPDM-rubber O-rings.
  - i. Handle: Tee shaped.

### **B. CPVC Non-Union Ball Valves:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Valve, Inc.
  - b. Asahi/America.
  - c. KBI (King Bros. Industries).
  - d. NIBCO INC.
  - e. Spears Manufacturing Company.



- f. Thermoplastic Valves, Inc.
- 2. Description:
  - a. Standard: MSS SP-122.
  - b. Pressure Rating and Temperature: 150 psig 73 deg F
  - c. Body Material: CPVC.
  - d. Body Design: Non-union type.
  - e. End Connections: Socket or threaded.
  - f. Ball: CPVC; full or reduced port.
  - g. Seals: PTFE or EPDM-rubber O-rings.
  - h. Handle: Tee shaped.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

#### **3.2 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 valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

### **3.3 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 or press-end option is indicated in valve schedules below.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
  - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
  - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

### **3.4 For Steel Piping, NPS 5 and Larger: Flanged ends DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE**

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze ball valve, one piece with bronze or stainless steel trim. Provide with threaded] or solder-joint ends.
  - 2. Bronze ball valves, two-piece with full or regular port and bronze or brass or stainless steel trim. Provide with threaded, solder or press connection-joint ends.
  - 3. Brass ball valves, three-piece with full port and brass, stainless steel trim.
  - 4. Bronze ball valves, three-piece with full port and bronze, brass or stainless steel trim.
  - 5. Bronze ball valves, two-piece with regular port and bronze or stainless-steel trim.
- B. Pipe NPS 2-1/2 and Larger:
  - 1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
  - 2. Steel ball valves, Class 150 with full or regular port.
  - 3. Iron ball valves, Class 150.
- C. CPVC Pipe NPS 4 and Smaller: Union-ball or Non-union ball valve.

END OF SECTION 220523.12

## **SECTION 220523.13 - BUTTERFLY VALVES 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. Iron, single-flange butterfly valves.
  - 2. Iron, grooved-end butterfly valves.
  - 3. CPVC butterfly valves.

#### **1.3 DEFINITIONS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set butterfly valves closed or slightly open.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## **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 B16.1 for flanges on iron valves.
  - 2. ASME B16.5 for flanges on steel valves.
  - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 4. ASME B31.9 for building service piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- 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 valves NPS 8 and larger.
  - 2. Handlever: For valves NPS 6 and smaller.
  - 3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.
- H. Valves in Insulated Piping: With 2-inch stem extensions.

### **2.2 IRON, SINGLE-FLANGE BUTTERFLY VALVES**

- A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABZ Valve and Controls.
    - b. Apollo Valves; Conbraco Industries, Inc.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.

- f. Stockham; Crane Energy Flow Solutions.
  - g. WATTS.
2. Description:
- a. Standard: MSS SP-67, Type I.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
  - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
  - e. Seat: [EPDM] [NBR].
  - f. Stem: One- or two-piece stainless steel.
  - g. Disc: Aluminum bronze.

**B. Iron, Single-Flange Butterfly Valves with Ductile-Iron Disc:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. ABZ Valve and Controls.
  - b. American Valve, Inc.
  - c. Apollo Valves; Conbraco Industries, Inc.
  - d. Hammond Valve.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Stockham; Crane Energy Flow Solutions.
  - h. WATTS.
2. Description:
- a. Standard: MSS SP-67, Type I.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
  - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
  - e. Seat: EPDM or NBR.
  - f. Stem: One- or two-piece stainless steel.
  - g. Disc: Nickel-plated or nickel-coated ductile iron.

**2.3 CPVC BUTTERFLY VALVES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Georg Fischer Inc.
  - 2. Hayward Flow Control.
  - 3. NIBCO INC.
  - 4. Thermoplastic Valves, Inc.

B. Description:

1. Pressure Rating and Temperature: 150 psig 73 deg F.
2. Body Material: CPVC.
3. Body Design: Lug or wafer type.
4. Seals: PTFE or EPDM-rubber O-rings.
5. Stem: Stainless steel.
6. Handle: Lever.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- D. Do not attempt to repair defective valves; replace with new valves.

**3.2 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 chainwheels on operators for butterfly valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

**3.3 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.

**3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE**

- A. Pipe NPS 2-1/2 and Larger:
  - 1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM or NBR seat, aluminum-bronze or stainless-steel disc.
  - 2. Ductile-Iron, Grooved-End Butterfly Valves: 175 CWP.
- B. CPVC Pipe NPS 2-1/2 and Larger: CPVC butterfly valve.

**END OF SECTION 220523.13**

## **SECTION 220523.14 - CHECK VALVES 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. Bronze swing check valves.
  - 2. Bronze swing check valves, press ends.
  - 3. CPVC ball check valves.

#### **1.3 DEFINITIONS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.



- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## **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. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.
- E. 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.
- F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. 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; Crane Energy Flow Solutions.
    - d. Hammond Valve.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Stockham; Crane Energy Flow Solutions.

h. WATTS.

2. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

### **2.3 CPVC BALL CHECK VALVES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Valve, Inc.
2. Asahi/America.
3. Georg Fischer Inc.
4. Hayward Flow Control.
5. NIBCO INC.
6. Thermoplastic Valves, Inc.

B. Description:

1. Pressure Rating and Temperature: 125 psig at 73 deg F.
2. Body Material: CPVC.
3. Body Design: Union-type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
5. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket, threaded or flanged.
6. Ball: CPVC.
7. Seals: EPDM- or FKM-rubber O-rings.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### **3.2 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. Check Valves: Install check valves for proper direction of flow.
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Check Valves: In horizontal or vertical position, between flanges.
- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

### **3.3 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.

### **3.4 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; or iron, center-guided, 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.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

D.

1. Iron swing check valves with metal nonmetallic-to-metal seats, Class 125, with threaded or flanged end connections.
2. Iron, grooved-end swing check valves, 300 CWP.
3. Iron, dual-plate check valves with metal resilient seat, class 125, with threaded or flanged end connections.
4. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

### **3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE**

A. Pipe NPS 2 and Smaller:

1. Bronze swing check valves with bronze or nonmetallic disc, Class 125, with soldered or threaded end connections.
2. Bronze swing check valves with press-end connections.

B. Pipe NPS 2-1/2 and Larger:

1. Iron swing check valves with metal or nonmetallic-to-metal seats, Class 125, with threaded or flanged end connections.
2. Iron swing check valves with closure control lever and spring weight, Class 125, with threaded or flanged end connections.
3. Iron, grooved-end swing check valves, 300 CWP.
4. Iron, center-guided check valves with compact wafer, Class 125.
5. Iron, center-guided check valves with globe, metal or resilient seat, Class 125, with threaded or flanged end connections.
6. Iron, dual-plate check valves with metal or resilient seat, Class 125, with threaded or flanged end connections.
7. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

C. CPVC Pipe NPS 4 and Smaller: CPVC ball check valve.

**END OF SECTION 220523.14**

## **SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND 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. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Thermal hanger-shield inserts.
  - 4. Fastener systems.
- 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"

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
- 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. Detail fabrication and assembly of trapeze hangers.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

## **1.5 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.

### **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 METAL FRAMING SYSTEMS**

- A. MFMA Manufacturer Metal Framing Systems:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. B-line, an Eaton business.
    - b. Thomas & Betts Corporation; A Member of the ABB Group.
    - c. Unistrut; Part of Atkore International.
  2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
  3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
  4. Channels: Continuous slotted carbon-steel channel with inturned lips.
  5. Channel Width: Selected for applicable load criteria.
  6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
  7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
  8. Metallic Coating: Plain.
  9. Paint Coating: Green epoxy, acrylic, or urethane.

### **2.5 THERMAL HANGER-SHIELD INSERTS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carpenter & Paterson, Inc.
  2. ERICO International Corporation.
  3. National Pipe Hanger Corporation.
  4. Pipe Shields Inc.
  5. Rilco Manufacturing Co., Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## **2.6 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.
- 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. B-line, an Eaton business.
    - b. Empire Tool and Manufacturing Co., Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - e. MKT Fastening, LLC.
  - 2. Indoor Applications: Zinc-coated or stainless steel.

## **2.7 PIPE STANDS**

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand:
  - 1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
  - 2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
    - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.



3. Hardware: Galvanized steel or polycarbonate.
4. Accessories: Protection pads.

C. Low-Profile, Single-Base, Single-Pipe Stand:

1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

## **2.8 MATERIALS**

- A. Aluminum: ASTM B 221.
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.
- E. Grout: ASTM C 1107/C 1107M, 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 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. 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.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. 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.
- I. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. 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.
- K. 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 METAL FABRICATIONS**

- A. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- B. 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: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

### **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-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, metal trapeze pipe hangers and metal framing systems 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. 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.
- 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 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.
- 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. 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.
- 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. 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.
- P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- S. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

**END OF SECTION 220529**

## **SECTION 220533 - HEAT TRACING 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 plumbing piping heat tracing for freeze prevention, domestic hot-water-temperature maintenance, and snow and ice melting on roofs and in gutters and downspouts with the following electric heating cables:
  - 1. Self-regulating, parallel resistance.
- B. Related Requirements:
  - 1. Section 210533 "Heat Tracing for Fire-Suppression Piping."

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
  - 2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
- B. Shop Drawings: For electric heating cable.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include diagrams for power, signal, and control wiring.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. Sample Warranty: For special warranty.



## **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

## **1.6 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Three years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  - 1. Nelson Heat Trace; a division of EGS Electrical Group LLC.
  - 2. Raychem; a brand of Tyco Thermal Controls LLC.
- C. Comply with IEEE 515.1.
- D. Heating Element: Pair of parallel No. 16 AWG, tinned or nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.
- E. Electrical Insulating Jacket: Flame-retardant polyolefin.
- F. Cable Cover: Tinned-copper braid.
- G. Maximum Operating Temperature (Power On): 150 deg F.
- H. Maximum Exposure Temperature (Power Off): 185 deg F.
- I. 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.
- J. Capacities and Characteristics:
  - 1. Number of Parallel Cables: 2.
  - 2. Electrical Characteristics for Single-Circuit Connection:

- a. Volts: 115 ,208 or 480a.

## **2.2 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.

## **PART 3 - EXECUTION**

### **3.1 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- B. Set field-adjustable switches and circuit-breaker trip ranges.

### **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."

### **3.4 PROTECTION**

- A. Protect installed heating cables, including nonheating leads, from damage during construction.
- B. Remove and replace damaged heat-tracing cables.

**END OF SECTION 220533**

## **SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND 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. Equipment labels.
- 2. Pipe labels.
- 3. Valve tags.

#### **1.3 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.

### **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:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
    - a. Brady Corporation.
    - b. Brimar Industries, Inc.

- c. Carlton Industries, LP.
  - d. Champion America.
  - e. Craftmark Identification Systems.
  - f. emedco.
  - g. Kolbi Pipe Marker Co.
  - h. LEM Products Inc.
  - i. Marking Services Inc.
  - j. Seton Identification Products.
3. Material and Thickness: aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  4. Letter Color: Black.
  5. Background Color: Yellow.
  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.

## **2.2 PIPE LABELS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  1. Actioncraft Products, Inc.
  2. Brady Corporation.
  3. Brimar Industries, Inc.
  4. Carlton Industries, LP.
  5. Champion America.
  6. Craftmark Identification Systems.
  7. emedco.
  8. Kolbi Pipe Marker Co.
  9. LEM Products Inc.
  10. Marking Services Inc.
  11. Seton Identification Products.
- C. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- 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.

### **2.3 VALVE TAGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
  - 1. Actioncraft Products, Inc.
  - 2. Brady Corporation.
  - 3. Brimar Industries, Inc.
  - 4. Carlton Industries, LP.
  - 5. Champion America.
  - 6. Craftmark Identification Systems.
  - 7. emedco.
  - 8. Kolbi Pipe Marker Co.
  - 9. LEM Products Inc.
  - 10. Marking Services Inc.
  - 11. Seton Identification Products.
- C. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link chain, beaded chain or S-hook.
- D. 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 GENERAL INSTALLATION REQUIREMENTS**

- 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.

**3.3 EQUIPMENT LABEL INSTALLATION**

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

**3.4 PIPE LABEL INSTALLATION**

- A. 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 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. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- 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.

### **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 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. Cold Water: 1-1/2 inches, square.
    - b. Hot Water: 1-1/2 inches, square.
  2. Valve-Tag Colors:
    - a. Cold Water: Safety green.
    - b. Hot Water: Safety green.
  3. Letter Colors:
    - a. Cold Water: White.
    - b. Hot Water: White.

**END OF SECTION 220553**

## **SECTION 220719 - PLUMBING PIPING 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 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.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- 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.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.



### **1.5 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.

### **1.6 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.

### **1.7 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.

### **1.8 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 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 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.

#### **3.3 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] <Insert value> 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.

### **3.4 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 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."

### **3.5 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.

### **3.6 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 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.

### **3.8 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. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless steel jackets.

### **3.9 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.

### **3.10 INDOOR PIPING INSULATION SCHEDULE**

- A. Sanitary Waste Piping Where Heat Tracing Is Installed:
  1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inchesthick.
- B. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
  1. All Pipe Sizes: Insulation shall be one of the following:



- a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- b. Polyolefin: 1 inch thick.

C. Hot Service Drains:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Hot Service Vents:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

**3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

A. Domestic Water Piping:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
  - b. Polyolefin: 2 inches thick.

B. Domestic Hot and Recirculated Hot Water:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
  - b. Polyolefin: 2 inches thick.

C. Sanitary Waste Piping Where Heat Tracing Is Installed:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

D. Hot Service Drains:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Hot Service Vents:

- 1. All Pipe Sizes: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

**3.12 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE**

- A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed: Cellular glass, 2 inches thick.
- B. Chilled Water, All Sizes: Cellular glass, 2 inches thick.

**3.13 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. Piping, Concealed:
  - 1. None.

**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 FIELD CONDITIONS**

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without Owner's written permission.

### **PART 2 - PRODUCTS**

#### **2.1 PIPING MATERIALS**

- A. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

### **PART 3 - EXECUTION**

#### **3.1 PIPING APPLICATIONS**

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
  - 1. Annealed-temper copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed or copper pressure-seal fittings; and pressure-sealed joints.
  - 2. Polypropylene (PP-R), SDR 7.4 or SDR 11 pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.

- D. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:
1. Annealed-temper copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
  2. Polypropylene (PP-R), SDR 7.4 or SDR 11 pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Drawn-temper or annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed or copper pressure-seal-joint fittings; and pressure-sealed joints.
  2. Polypropylene (PP-R), SDR 7.4 or SDR 11 pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
- F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Drawn-temper copper tube, ASTM B88, Type L; copper, solder-joint fittings; and brazed or soldered joints.
  2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
  3. Drawn-temper copper tube, ASTM B88, Type L; copper push-on-joint fittings; and push-on joints.
  4. PEX tube, NPS 1 and smaller.
    - a. Fittings for PEX tube:
      - 1) ASTM F1807, metal insert and copper crimp rings.
      - 2) ASTM F1960, cold expansion fittings and reinforcing rings.
      - 3) ASSE 1061, push-fit fittings.
  5. PE-AL-PE tube, NPS 1 and smaller; fittings for PE-AL-PE tube; and crimped joints
  6. PEX-AL-PEX tube, NPS 1 and smaller; fittings for PEX-AL-PEX tube; and crimped joints.
  7. CPVC (ASTM D2846), composition CPVC 4120 (23447), SDR 11, not threaded, for all sizes.
  8. CPVC (ASTM F441), composition CPVC 4120 (23447), schedule 40, not threaded, up through 1-inch in size.
- G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
1. Drawn-temper copper tube, ASTM B88, Type L; copper, solder-joint fittings; and brazed or soldered joints.
  2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
  3. Drawn-temper copper tube, ASTM B88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.
  4. CPVC (ASTM D2846), composition CPVC 4120 (23447), SDR 11, not threaded, for all sizes.

### **3.2 EARTHWORK**

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

### **3.3 INSTALLATION OF PIPING**

- 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 in PE encasement according to ASTM A674 or AWWA C105/A21.5.
- E. Install valves according to the following:
  - 1. Section 220523.12 "Ball Valves for Plumbing Piping."
  - 2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
  - 3. Section 220523.14 "Check Valves for Plumbing Piping."
  - 4. Section 220523.15 "Gate Valves for Plumbing Piping."
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- 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 gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges 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."

### **3.4 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," "Braze 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. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. 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.
- I. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- J. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. 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.
- K. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Square cut or Roll groove ends of pipe as specified. 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.
- L. 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.
- M. Joint Construction for Solvent-Cemented Plastic Piping: 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.
- N. Joints for PEX Tubing, ASTM: Join according to ASTM F1807 for metal insert and copper crimp ring fittings and ASTM F1960 for cold expansion fittings and reinforcing rings.
- O. Joints for PEX Tubing, ASSE: Join according to ASSE 1061 for push-fit fittings.
- P. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### **3.5 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Install hangers with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install vinyl-coated hangers for piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within 12 inches of each fitting.
- F. Support vertical runs of to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### **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: 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."

### **3.8 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.

### **3.9 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.

**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. Balancing valves.
  - 2. Temperature-actuated, water mixing valves.
  - 3. Strainers for domestic water piping.
  - 4. Outlet boxes.
  - 5. Hose bibbs.
  - 6. Wall hydrants.
  - 7. Ground hydrants.
  - 8. Drain valves.
  - 9. Water-hammer arresters.
  - 10. Trap-seal primer device.
  - 11. Trap-seal primer systems.

#### **1.3 DEFINITIONS**

- A. AMI: Advanced Metering Infrastructure.
- B. AMR: Automatic Meter Reading.
- C. FKM: A family of fluoroelastomer materials defined by ASTM D1418.

#### **1.4 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.

## **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

### **2.2 BALANCING VALVES**

- A. Copper-Alloy Calibrated Balancing Valves <Insert drawing designation if any>:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Bell & Gossett; a Xylem brand.
    - b. NIBCO INC.
    - c. WATTS.
  - 2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
  - 3. Body: bronze.
  - 4. Size: Same as connected piping, but not larger than NPS 2.

### **2.3 TEMPERATURE-ACTUATED, WATER MIXING VALVES**

- A. Water-Temperature Limiting Devices :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. Leonard Valve Company.
    - c. POWERS; A WATTS Brand.
    - d. WATTS.
    - e. Zurn Industries, LLC.
  - 2. Standard: ASSE 1070.
  - 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: Chrome plated or Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Flow Controls; Conbraco Industries, Inc.
  - b. Leonard Valve Company.
  - c. POWERS; A WATTS Brand.
  - d. Zurn Industries, LLC.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

C. Photographic-Process, Thermostatic, Water Mixing Valve Assemblies <Insert drawing designation if any>:

1. Cabinet: Factory fabricated, stainless steel, for surface mounting; with controls and thermometer mounted on front.

D. Individual-Fixture, Water Tempering Valves <Insert drawing designation if any:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Engineering Company; a Division of Morris Group International.
  - b. Leonard Valve Company.
  - c. POWERS; A WATTS Brand.
  - d. Zurn Industries, LLC.
2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Material: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Connections: Threaded inlets and outlet.
7. Finish: Chrome plated.

E. Primary Water Tempering Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Heat-Timer Corporation.
  - b. Holby Valve Inc.

2. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Material: Bronze body.
5. Temperature Control: Manual.
6. Connections: Threaded inlets and outlet.
7. Selected Primary Water Tempering Valve Size: As noted on drawings.

## **2.4 STRAINERS FOR DOMESTIC WATER PIPING**

### **A. Y-Pattern Strainers :**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Titan Flow Control, Inc.
  - b. WATTS.
  - c. Zurn Industries, LLC.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and] for NPS 2-1/2 and larger.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
5. Screen: Stainless steel with round perforations unless otherwise indicated.

## **2.5 OUTLET BOXES**

### **A. Clothes Washer Outlet Boxes :**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Engineering Company; a Division of Morris Group International.
  - b. Guy Gray, IPS Corporation.
  - c. Oatey.
  - d. Sioux Chief Manufacturing Company, Inc.
  - e. Water-Tite, IPS Corporation.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel, Enameled-steel, epoxy-painted-steel, or plastic, Plastic or Stainless steel 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. Drain Outlet Connection: NPS 2.
6. Accessory: Water hammer arresters.
7. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.

8. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
9. Inlet Hoses: Two 60-inch long, rubber, household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
10. 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, provide products by one of the following:
  - a. Guy Gray, IPS Corporation.
  - b. Oatey.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Water-Tite, IPS Corporation.
2. Mounting: Recessed
3. Material and Finish: Enameled-steel or epoxy-painted-steel, Enameled-steel, epoxy-painted-steel, or plastic, [Plastic or Stainless steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Accessory: Water hammer arrestor.
6. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

**2.6 HOSE BIBBS**

**A. Hose Bibbs :**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. MIFAB, Inc.
  - c. Zurn Industries, LLC.
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Rough bronze, Chrome or nickel plated.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Wheel handle or Operating key.

14. Operation for Finished Rooms: Wheel handle or Operating key.
15. Include operating key with each operating-key hose bibb.
16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## **2.7 WALL HYDRANTS**

### **A. Nonfreeze Wall Hydrants :**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Prier Products, Inc.
  - e. WATTS.
  - f. Woodford Manufacturing Company.
  - g. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for concealed or exposed-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.
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 or Rough 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, Rough bronze or Chrome plated .
12. Operating Keys(s): Two with each wall hydrant.

## **2.8 GROUND HYDRANTS**

### **A. Nonfreeze Ground Hydrants :**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Murdock Manufacturing; A Division of Morris Group International.
  - e. Prier Products, Inc.
  - f. WATTS.



- g. Woodford Manufacturing Company.
  - h. Zurn Industries, LLC.
  - i. Insert manufacturer's name.
2. Standard: ASME A112.21.3M.
  3. Type: Nonfreeze, concealed-outlet ground hydrant with box.
  4. Operation: Loose key.
  5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
  6. Inlet: NPS 3/4.
  7. Outlet: Garden-hose thread complying with ASME B1.20.7.
  8. Drain: Designed with hole to drain into ground when shut off.
  9. Box: Deep pattern with cover.
  10. Box and Cover Finish: Rough or Polished nickel bronze.
  11. Operating Key(s): Two with each ground hydrant.
  12. Vacuum Breaker: ASSE 1011.

## **2.9 DRAIN VALVES**

### **A. Ball-Valve-Type, Hose-End Drain Valves :**

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

### **B. 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 B62 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.

### **C. 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 B62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

**2.10 WATER-HAMMER ARRESTERS**

A. Water-Hammer Arresters :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AMTROL, Inc.
  - b. Jay R. Smith Mfg Co; a division of Morris Group International.
  - c. Josam Company.
  - d. MIFAB, Inc.
  - e. Precision Plumbing Products.
  - f. Sioux Chief Manufacturing Company, Inc.
  - g. WATTS.
  - h. Zurn Industries, LLC.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows, Piston or Diaphragm.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

**2.11 TRAP-SEAL PRIMER DEVICE**

A. Supply-Type, Trap-Seal Primer Device :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Precision Plumbing Products.
  - e. Sioux Chief Manufacturing Company, Inc.
  - f. WATTS.
  - g. Zurn Industries, LLC.
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.

B. Drainage-Type, Trap-Seal Primer Device :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.

- b. MIFAB, Inc.
  - c. Precision Plumbing Products.
  - d. Zurn Industries, LLC.
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
  3. Size: NPS 1-1/4 minimum.
  4. Material: Chrome-plated, cast brass.

## **2.12 TRAP-SEAL PRIMER SYSTEMS**

### **A. Trap-Seal Primer Systems:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Precision Plumbing Products.
  - b. Sioux Chief Manufacturing Company, Inc.
  - c. Zurn Industries, LLC.
2. Standard: ASSE 1044.
3. Inlet Size: NPS 3/4, ASTM B88, Type L; copper, water tubing.
4. Cabinet: Recessed or 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. Number Outlets: Four, or Six .
8. Size Outlets: NPS 1/2.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF PIPING SPECIALTIES**

- A. Backflow Preventers: Install 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.
- B. Water Control Valves: Install with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gauges on inlet and outlet.
- C. Nonfreeze, Sanitary Yard Hydrants: Set with riser pipe in concrete or pavement. Do not encase canister in concrete.

**3.2 PIPING CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

**3.3 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.

**3.4 CONTROL CONNECTIONS**

- A. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

**3.5 IDENTIFICATION**

- 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."

**3.6 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.
- D. Adjust each in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

**END OF SECTION 221119**

## **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 FIELD CONDITIONS**

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

### **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. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

#### **2.2 PIPING MATERIALS**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. 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.

**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 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.
  - 1. 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.
  - 2. 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.
    - a. Straight tees, elbows, and crosses may be used on vent lines.
  - 3. Do not change direction of flow more than 90 degrees.
  - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

- a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste 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 according to 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.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
  3. 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 stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.
- P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- Q. Install aboveground ABS piping according to ASTM D 2661.
- R. Install aboveground PVC piping according to ASTM D 2665.
- S. Install engineered soil and waste and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
  3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- T. Install underground, ductile-iron, force-main piping according to AWWA C600.
1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
  2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
  3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.
- U. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.
  - V. Install force mains at elevations indicated.
  - W. Plumbing Specialties:
    1. Install backwater valves in sanitary waster gravity-flow piping.
      - a. 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 waste gravity-flow piping.
      - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
      - b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
    3. Install drains in sanitary waste gravity-flow piping.
      - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
  - X. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
  - Y. 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."
  - Z. 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."
  - AA. 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. 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.
  - 1. Cut threads full and clean using sharp dies.
  - 2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    - a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    - b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
    - c. Do not use pipe sections that have cracked or open welds.
- E. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.
- F. 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.
- G. 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.
- H. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- I. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

### **3.4 VALVE INSTALLATION**

- A. Comply with requirements 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" for general-duty valve installation requirements.
- 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.
  - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
  - 3. Install backwater valves in accessible locations.
  - 4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

### **3.5 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 6. 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.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Install hangers for piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping and tubing within 12 inches of each fitting, **valve**, and coupling.
- E. Support vertical runs of soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support vertical runs of piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### **3.6 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 waste and vent piping to the following:
  - 1. Plumbing Fixtures: Connect waste 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 waste 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, if needed, with cleanout cover flush with floor.
  - 6. Comply with requirements for backwater valves, cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
  - 7. Equipment: Connect waste piping as indicated.
    - a. Provide shutoff valve if indicated and union for each connection.
    - b. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- 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.

### **3.7 IDENTIFICATION**

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### **3.8 CLEANING AND PROTECTION**

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping 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.
- D. Exposed Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

### **3.9 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. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings]; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
  - 3. Galvanized-steel pipe, drainage fittings, and threaded joints.
  - 4. Stainless-steel pipe and fittings, sealing rings, and gasketed joints.
  - 5. Copper Type DWV tube, copper drainage fittings, and soldered joints.
  - 6. Solid-wall or Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
  - 7. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 8. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
  - 3. Galvanized-steel pipe, drainage fittings, and threaded joints.
  - 4. Stainless-steel pipe and fittings, sealing rings, and gasketed joints.
  - 5. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 6. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
  - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  - 2. Hubless, cast-iron soil pipe and fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
  - 3. Galvanized-steel pipe, drainage fittings, and threaded joints.
  - 4. Stainless-steel pipe and fittings gaskets, and gasketed joints.

5. Copper Type DWV tube, copper drainage fittings, and soldered joints.
    - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
  6. Solid-wall or Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
  7. Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  8. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.
- E. Aboveground, vent piping NPS 5 shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Hubless, cast-iron soil pipe and fittings; CISPI or heavy-duty hubless-piping couplings; and coupled joints.
  3. Galvanized-steel pipe, drainage fittings, and threaded joints.
  4. Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  5. Dissimilar Pipe-Material Couplings: Unshielded or Shielded, nonpressure transition couplings.
- F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
1. Extra Heavy or Service class, cast-iron soil piping; gaskets; and gasketed or calking materials; and calked joints.
  2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
- G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
1. Extra Heavy or Service class, cast-iron soil piping; gaskets; and gasketed or calking materials; and calked joints.

**END OF SECTION 221316**

## **SECTION 221319.13 - SANITARY DRAINS**

### **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. Floor drains.
  - 2. Trench drains.

#### **1.3 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.

#### **1.4 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, products by one of the following:
  - a. Commercial Enameling Company.
  - b. Jay R. Smith Mfg. Co.
  - c. Josam Company.
  - d. MIFAB, Inc.
  - e. WATTS.
  - f. Zurn Industries, LLC.
2. Pattern: Floor, Funnel floor, Sanitary drain.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Top or Strainer Material: Nickel bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Loading Classification: Medium Duty.
11. Trap Material: Cast iron.
12. Trap Pattern: Deep-seal P-trap or Standard P-trap.
13. Trap Features: Trap-seal primer valve drain connection.

## **2.3 TRENCH DRAINS**

### **A. Trench Drains:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg. Co.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Clamping Device: Required.
5. Trap Material: Cast iron.
6. Trap Pattern: Standard 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.
- B. Install trench drains at low points of surface areas to be drained.
  - 1. Set grates of drains flush with finished surface, unless otherwise indicated.
- C. Comply with ASME A112.3.1 for installation of stainless-steel channel drainage systems.
  - 1. Install on support devices, so that top will be flush with adjacent surface.
- D. Install FRP channel drainage system components on support devices, so that top will be flush with adjacent surface.
- E. Install plastic channel drainage system components on support devices, so that top will be flush with adjacent surface.
- F. Install open drain fittings with top of hub above floor.

### **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 221319.13 - SANITARY DRAINS**

### **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. Floor drains.
  - 2. Trench drains.

#### **1.3 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.

#### **1.4 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, products by one of the following:
  - a. Commercial Enameling Company.
  - b. Jay R. Smith Mfg. Co.
  - c. Josam Company.
  - d. MIFAB, Inc.
  - e. WATTS.
  - f. Zurn Industries, LLC.
2. Pattern: Floor, Funnel floor, Sanitary drain.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Top or Strainer Material: Nickel bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Loading Classification: Medium Duty.
11. Trap Material: Cast iron.
12. Trap Pattern: Deep-seal P-trap or Standard P-trap.
13. Trap Features: Trap-seal primer valve drain connection.

## **2.3 TRENCH DRAINS**

### **A. Trench Drains:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg. Co.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Clamping Device: Required.
5. Trap Material: Cast iron.
6. Trap Pattern: Standard 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.
- B. Install trench drains at low points of surface areas to be drained.
  - 1. Set grates of drains flush with finished surface, unless otherwise indicated.
- C. Comply with ASME A112.3.1 for installation of stainless-steel channel drainage systems.
  - 1. Install on support devices, so that top will be flush with adjacent surface.
- D. Install FRP channel drainage system components on support devices, so that top will be flush with adjacent surface.
- E. Install plastic channel drainage system components on support devices, so that top will be flush with adjacent surface.
- F. Install open drain fittings with top of hub above floor.

#### **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 221323 - SANITARY WASTE INTERCEPTORS

### 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. Solids interceptors.

#### 1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. PP: Polypropylene plastic.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For metal interceptor. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size and location of each pipe connection, furnished specialties, and accessories.
- B. Shop Drawings: For each type and size of precast concrete interceptor indicated.
  - 1. Include materials of construction, dimensions, rated capacities, retention capacities, location and size of each pipe connection, furnished specialties, and accessories.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Piping connections. Include size, location, and elevation of each.
  - 2. Interface with underground structures and utility services.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services according to requirements indicated:
1. Notify owner no fewer than seven days in advance of proposed interruption of service.
  2. Do not proceed with interruption of sewer services without owner's written permission.

PART 2 - PRODUCTS

2.1 SOLIDS INTERCEPTORS

- A. Cast-Iron or Steel Solids (Lint) Interceptors labeled LT:
1. Type: Factory-fabricated interceptor made for removing and retaining lint from wastewater.
  2. Body Material: Cast iron or steel.
  3. Interior Separation Device: Baffles or Screens
  4. Interior Lining: Corrosion-resistant enamel.
  5. Exterior Coating: Corrosion-resistant enamel.
  6. Body Dimensions: 28.5" x 20.5" x 24" tall.
  7. Flow Rate: 40 GPM.
  8. Inlet and Outlet Size: 3".
  9. End Connections: No hub.
  10. Mounting: Above floor on a concrete pad with height adjusted based on elevation and pitch of washer gravity drain line and mop sink rim elevation.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION

- A. Equipment Mounting:
1. Install solids interceptors on cast-in-place concrete equipment base(s).
  2. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." and/or Section 033053 "Miscellaneous Cast-in-Place Concrete."
- B. Install precast concrete interceptors according to ASTM C 891.

- C. Set interceptors level and plumb.
- D. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.
- E. Set tops of manhole frames and covers flush with finished surface in pavements.
  - 1. Set tops 3 inches above finish surface elsewhere unless otherwise indicated.
- F. Set tops of grating frames and grates flush with finished surface.
- G. Set metal interceptor level and plumb.
- H. Set tops of metal interceptor covers flush with finished surface in pavements.
  - 1. Set tops 3 inches above finish surface elsewhere unless otherwise indicated.
- I. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet.
  - 1. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Make piping connections between interceptors and piping systems.

### 3.4 IDENTIFICATION

- A. Identification materials and installation are specified in Section 312000 "Earth Moving."
  - 1. Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
  - 2. Use warning tapes or detectable warning tape over ferrous piping.
  - 3. Use detectable warning tape over nonferrous piping and over edges of underground structures.
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Solids interceptors.



3.5 PROTECTION

- A. Protect sanitary waste interceptors from damage during construction period.
- B. Repair damage to adjacent materials caused by sanitary waste interceptor installation.

END OF SECTION 221323

SECTION 221329 - SANITARY SEWERAGE PUMPS

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. Packaged wastewater-pump units.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- 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. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PACKAGED WASTEWATER-PUMP UNITS

- A. Packaged, Wastewater-Pump Units:
1. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, effluent-pump unit.
  2. Pump Type: single-stage, separately-coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
  3. Pump Body and Impeller: Corrosion-resistant materials.
  4. Motor: With built-in overload protection and mounted vertically on basin cover.
  5. Power Cord: Three-conductor, waterproof cable of length required but not less than 48 inches with grounding plug and cable-sealing assembly for connection at pump.
  6. Control: Float switch.
  7. Pump Discharge Piping: Factory or field fabricated, galvanized, ASTM A 53/A 53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray iron threaded fittings.
  8. Basin: Watertight, aluminum, plastic, or coated steel with inlet pipe connection and gastight cover with vent and pump discharge connections.
  9. Capacities and Characteristics:
    - a. Pump Capacity: 18 gpm.
    - b. Total Dynamic Head: 14 feet of head.
    - c. Speed: 3600.
    - d. Discharge Pipe Size: 1-1/2"; Inlet: 2":
    - e. Motor Horsepower: 0.3
    - f. Electrical Characteristics:
      - 1) Volts: 120.
      - 2) Phases: Single.
      - 3) Hertz: 60.
    - g. Unit Electrical Characteristics:
      - 1) Amperes: 4.5
    - h. Basin:
      - 1) Capacity: 2.75 gallons minimum.
      - 2) Inlet Connection: 2" minimum.
      - 3) Vent Connection: 1-1/2" minimum.

## 2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors 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.
- B. Motors for submersible pumps shall be hermetically sealed.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation and filling are specified in Section 312000 "Earth Moving."

### 3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

### 3.3 INSTALLATION

- A. Pump Installation Standards:
  - 1. Comply with HI 1.4 for installation of centrifugal pumps.
  - 2. Comply with HI 3.1-3.5 for installation of progressing-cavity sewage pumps.
- B. Equipment Mounting:
  - 1. Install progressing-cavity sewage 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.
  - 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"
  - 3. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
- C. Wiring Method: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- D. 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.

3.4 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

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. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.8 DEMONSTRATION

- A. Owner's maintenance personnel to adjust, operate, and maintain pumps.

END OF SECTION 221329

SECTION 223300 - ELECTRIC, DOMESTIC-WATER 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. Commercial, electric, storage, domestic-water heaters.
  - 2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters 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 size of domestic-water heater indicated mounted on wall supports.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For commercial domestic-water heaters, 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.

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- B. Product Certificates: For each type of commercial, electric, domestic-water heater, from manufacturer.
- C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Warranty: Sample of special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- 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. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of wall supports with actual equipment provided.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.
    - b. Faulty operation of controls.



- c. Deterioration of metals, metal finishes, and other materials beyond normal use.
- 2. Warranty Periods: From date of Substantial Completion.
  - a. Commercial, Electric, Storage, Domestic-Water Heaters:
    - 1) Storage Tank: Three years.
    - 2) Controls and Other Components: Three years.

## PART 2 - PRODUCTS

### 2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Commercial, Electric, Storage, Domestic-Water Heaters:
  - 1. Standard: UL 1453.
  - 2. Storage-Tank Construction: **Non** ASME-code, steel vertical arrangement.
    - a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
      - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
    - b. Pressure Rating: 150 psig
    - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
  - 3. Factory-Installed Storage-Tank Appurtenances:
    - a. Anode Rod: Replaceable magnesium.
    - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
    - c. Insulation: Comply with ASHRAE/IESNA 90.1.
    - d. Jacket: Steel with enameled finish.
    - e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
    - f. Temperature Control: Adjustable thermostat.
    - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
    - h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
  - 4. Special Requirements: NSF 5 construction.

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2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- C. Heat-Trap Fittings: ASHRAE 90.2.
- D. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.
  - 1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
  - 2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig maximum outlet pressure unless otherwise indicated.
- F. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- J. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

### PART 3 - EXECUTION

#### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specifications.
- B. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, is indicated.
  - 1. Maintain manufacturer's recommended clearances.
  - 2. Arrange units so controls and devices that require servicing are accessible.
  - 3. For supported equipment, install epoxy-coated anchor bolts that extend through wall and anchor into structural wall.
  - 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 supported equipment.
  - 6. Anchor domestic-water heaters to substrate.
- C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15.
- D. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

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- G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- H. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- I. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- J. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- K. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig. Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."
- L. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- M. Fill electric, domestic-water heaters with water.
- N. Charge domestic-water compression tanks with air.

### 3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

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3.4 FIELD QUALITY CONTROL

- A. 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.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
  
- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Owner's maintenance personnel to adjust, operate, and maintain commercial electric, domestic-water heaters.

END OF SECTION 223300

## **SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES**

### **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. Lavatories.
  - 2. Lavatory faucets.
  - 3. Kitchen sinks.
  - 4. Laundry trays
  - 5. Sink faucets.
  - 6. Water closets.
  - 7. Toilet seats.
  - 8. Supply fittings.
  - 9. Waste fittings.
  - 10. Grout.

#### **1.3 DEFINITIONS**

- A. FRP: Fiberglass-reinforced plastic.
- B. PMMA: Polymethyl methacrylate, also known as "acrylic."

#### **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 lavatories.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Sustainable Design Submittals:

1. Product Data: For water consumption.
2. Plumbing Fixtures: Provide the following:
  - a. Manufacturer cut sheet indicating water consumption.
  - b. Water Sense certification for residential fixtures, commercial water closets, commercial urinals, and commercial showers.
- C. Shop Drawings: Include diagrams for power, signal, and control wiring.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.
- B. Sample Warranty: For special warranty.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
  3. Flushometer-Tank Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than two of each type.
  4. Toilet Seats: Equal to 5 percent of amount of each type installed.

#### **1.8 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of plumbing fixtures that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:

- a. Structural failures of unit shell.
  - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period for Residential Applications of Shells: Five years from date of Substantial Completion.
  3. Warranty Period for Residential Applications of Electronic Controls: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

### **2.2 LAVATORIES**

#### **A. Lavatories – Single Piece Molded Design**

1. Vitreous-China Lavatories:
  - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1) Bradley Corp.
2. Fixture:
  - a. Size: Refer to drawings
  - b. Faucet-Hole Punching: See plumbing fixture schedule.
  - c. Color: Kalahari Bowl Color.
  - d. “Stain” Swing Down Stainless-Steel Access Panel Type
  - e. “TS” Thumb Screw Access Panel Fastener Type
  - f. “S-Poly” Single Polypropylene P-Trap Waste Assembly Type
3. Faucet: As specified on plumbing fixture schedule.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

### **2.3 LAVATORY FAUCETS**

- #### **A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.**



B. Lavatory Faucets Valve – refer to plumbing fixture schedule:

1. General-Duty, Lavatory Faucets:

- 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) Bradley Corp.

2. Spout Outlet: 0.5 gpm.

3. Drain: Pop up.

## 2.4 KITCHEN SINKS

A. Kitchen Sinks - Counter Mounted:

1. Stainless Steel Undermount Kitchen Sinks:

- 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) American Standard.

2) Elkay Manufacturing Co.

3) Kohler Co.

2. Fixture:

a. ASME A112.19.1/CSA B45.2 for enameled steel OR cast-iron kitchen sinks.

b. ASME A112.19.3/CSA B45.4 for stainless steel kitchen sinks.

3. Provide ADA trap cover to prevent scalding.

## 2.5 LAUNDRY SINKS

A. Laundry Service Sinks / Mop Sink - Stainless Steel :

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. Griffin

2. Fixture:
  - a. Standard: ASME A112.19.1/CSA B45.2.
  - b. Mounting: Freestanding on manufacturer's standard metal stand or Flush, counter mounted with stainless steel ring and sealant or on-counter mounted with sealant.
3. Faucet: 6-inch swing spout, Chrome Finish, Center Set Brass, with aerator, lever handles, replaceable seats and stems.
4. Fixture:
  - a. Standard: IAPMO Z124.6/ANSI Z124.6.
  - b. Mounting: Freestanding on manufacturer's standard legs or separate, painted-steel stand, or floor mounted (refer to arch. drawings).

## **2.6 SINK FAUCETS**

- A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.
- B. Sink Faucets for Break Room (Kitchen) and Mop (Laundry) Stainless Steel Sink:
  1. General-Duty Sink Faucets:
    - 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:
      - a) Kohler (1.5 gpm for Break Room Sink). Provide point of use mixing valve per plumbing fixture schedule.
      - 2) Refer to drawings for Mop Sink/Laundry sink Griffin faucet.

## **2.7 WATER CLOSETS**

- A. Water Closets : Wall mounted, back outlet, vitreous china, 1.28 gal./flush.
  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 Standard.
  2. Bowl:

- a. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.5/CSA B45.15, and ASSE 1037/ASME A112.1060/CSA B125.16.
  - b. Bowl Type: Siphon jet.
  - c. Height: Handicapped/elderly.
  - d. Rim Contour: Elongated.
  - e. Water Consumption: Low.
  - f. Color: White.
3. Toilet Seat: Plastic elongated.
  4. Supply Fittings:
    - a. Standard: ASME A112.18.1/CSA B125.1.
    - b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
    - c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
      - 1) Operation: Loose key or Wheel handle.
    - d. Riser:
      - 1) Size: NPS 1-1/2.
      - 2) Material: Chrome-plated, soft-copper flexible tube or ASME A112.18.6/CSA 125.6, braided- or corrugated-stainless steel flexible hose riser.

## **2.8 SUPPLY FITTINGS**

- A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Lavatory, Kitchen Sink and Laundry Tray Supply Fittings:
  1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
  2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
    - a. Operation: Loose key or Wheel handle.
  3. Risers:

- a. Size:
  - 1) NPS 3/8 for lavatories.
  - 2) NPS 1/2 for kitchen sinks and laundry sinks.
- b. Material: Chrome-plated, soft-copper flexible tube or ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless-steel flexible hose riser.

## **2.9 WASTE FITTINGS**

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain:
  - 1. Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.
  - 2. Pop-up type with NPS 1-1/4 straight tailpiece as part of faucet for standard lavatories.
  - 3. Grid type with NPS 1-1/2 offset tailpiece for accessible kitchen sinks.
  - 4. Grid type with NPS 1-1/2 straight tailpiece for standard kitchen sinks and for laundry trays.
- C. Trap:
  - 1. Size:
    - a. NPS 1-1/4 or NPS 1-1/2 for lavatories.
    - b. NPS 1-1/2 for kitchen sinks and laundry trays.
  - 2. Material:
    - a. Chrome-plated, one-piece, cast-brass trap with swivel 0.029-inch- thick tubular brass wall bend; and chrome-plated-brass or -steel wall flange.

## **2.10 GROUT**

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; 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 EXAMINATION**

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install plumbing fixtures level and plumb in accordance with roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
  - 1. Omit trap on fixtures with integral traps.
  - 2. Omit trap on indirect wastes unless otherwise indicated.

- K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.
- M. Set in leveling bed of cement grout.
- N. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- O. 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."
- P. Seal joints between plumbing fixtures, counters, floors, 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."

### **3.3 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."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

### **3.4 ADJUSTING**

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

### **3.5 CLEANING AND PROTECTION**

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION 224100**

## **SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC 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 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.

#### **1.3 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 NEMA MG 1 unless otherwise indicated.
- B. 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. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. 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.
- K. 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.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

## **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 230513**

## **SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND 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. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Fastener systems.
5. Pipe stands.
6. Equipment supports.

- B. Related Requirements:

1. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
2. Section 233113 "Metal Ducts" for duct hangers and supports.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. 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.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

#### **1.5 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, Section IX.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. 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, 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-plated steel, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated 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 METAL FRAMING SYSTEMS**

- A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channels: Continuous slotted carbon-steel channel with inturned lips.
4. Channel Width: Selected for applicable load criteria.
5. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dip galvanized.

- B. Non-MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channels: Continuous slotted [carbon-steel] [stainless-steel] <Insert material> channel with inturned lips.
4. Channel Width: Select for applicable load criteria.
5. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dip galvanized.

### **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.
- 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. Indoor Applications: Zinc-coated or stainless-steel.
2. Outdoor Applications: Stainless steel.

## **2.6 PIPE STANDS**

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand:
  1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
  2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
  3. Hardware: Galvanized steel or polycarbonate.
  4. Accessories: Protection pads.
- C. Low-Profile, Single Base, Single-Pipe Stand:
  1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
  2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
  3. Vertical Members: Two, galvanized -steel, continuous-thread 1/2-inch rods.
  4. Horizontal Member: Adjustable horizontal, galvanized -steel pipe support channels.
  5. Pipe Supports: Roller.
  6. Hardware: Galvanized steel.
  7. Accessories: Protection pads.
  8. Height: 12 inches above roof.

## **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; galvanized.
- D. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

- 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 the 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.
- 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 Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- 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. 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.
  - 3. Thermal-Hanger Shields: Install with insulation 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; 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.

### **3.5 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 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 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 metal trapeze pipe hangers and metal framing systems 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. 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. 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.
  - 3. 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.
  - 4. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
  - 5. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 6. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 7. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- I. 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.
- J. 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.
  - 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.
- K. 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-joint 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. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  10. 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.
  11. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  12. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  13. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- L. 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.
- M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

**END OF SECTION 230529**

## **SECTION 230548.13 - VIBRATION CONTROLS 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. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Open-spring isolators.
4. Elastomeric hangers.
5. Spring hangers.
6. Restrained isolation roof-curb rails.

- B. Related Requirements:

1. Section 210548.13 "Vibration Controls for Fire Suppression" for devices for fire-suppression equipment and systems.
2. Section 220548.13 "Vibration Controls for Plumbing" for devices for plumbing equipment and systems.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

- B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
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.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show coordination of vibration isolation device installation for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For testing agency.
- C. Welding certificates.

#### **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### **PART 2 - PRODUCTS**

#### **2.1 ELASTOMERIC ISOLATION PADS**

- A. Elastomeric Isolation Pads: .
  - 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. Ace Mountings Co., Inc.
    - b. California Dynamics Corporation.
    - c. Isolation Technology, Inc.
    - d. Kinetics Noise Control, Inc.
    - e. Mason Industries, Inc.
    - f. Vibration Eliminator Co., Inc.
    - g. Vibration Isolation.
    - h. Vibration Mountings & Controls, Inc.
  - 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.
  - 5. Surface Pattern: Waffle pattern.

#### **2.2 ELASTOMERIC ISOLATION MOUNTS**

- A. Double-Deflection, Elastomeric Isolation Mounts: .

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. Ace Mountings Co., Inc.
  - b. California Dynamics Corporation.
  - c. Isolation Technology, Inc.
  - d. Kinetics Noise Control, Inc.
  - e. Mason Industries, Inc.
  - f. Vibration Eliminator Co., Inc.
  - g. Vibration Isolation.
  - h. Vibration Mountings & Controls, Inc.
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-resistant rubber, neoprene, or other elastomeric material.

### **2.3 OPEN-SPRING ISOLATORS**

- A. Freestanding, Laterally Stable, Open-Spring Isolators: <Insert drawing designation>
  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. Ace Mountings Co., Inc.
    - b. California Dynamics Corporation.
    - c. Isolation Technology, Inc.
    - d. Kinetics Noise Control, Inc.
    - e. Mason Industries, Inc.
    - f. Vibration Eliminator Co., Inc.
    - g. Vibration Isolation.
    - h. Vibration Mountings & Controls, Inc.
  2. Outside 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. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

## **2.4 ELASTOMERIC HANGERS**

### **A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .**

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. Ace Mountings Co., Inc.
  - b. California Dynamics Corporation.
  - c. Isolation Technology, Inc.
  - d. Kinetics Noise Control, Inc.
  - e. Mason Industries, Inc.
  - f. Vibration Eliminator Co., Inc.
  - g. Vibration Mountings & Controls, Inc.
  - h. .
2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

## **2.5 SPRING HANGERS**

### **A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: <Insert drawing designation>.**

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. Ace Mountings Co., Inc.
  - b. California Dynamics Corporation.
  - c. Kinetics Noise Control, Inc.
  - d. Mason Industries, Inc.
  - e. Vibration Eliminator Co., Inc.
  - f. Vibration Isolation.
  - g. Vibration Mountings & Controls, Inc.
  - h. .



2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

## **2.6 RESTRAINED ISOLATION ROOF-CURB RAILS**

- 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. Ace Mountings Co., Inc.
  2. California Dynamics Corporation.
  3. Kinetics Noise Control, Inc.
  4. Mason Industries, Inc.
  5. Novia; A Division of C&P.
  6. Thybar Corporation.
  7. .
- B. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment.
- C. Upper Frame: Upper frame shall provide continuous and captive support for equipment.
- D. Lower Support Assembly: The lower support assembly shall be formed sheet metal section containing adjustable and removable steel springs that support upper frame. The lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials and shall be insulated with a minimum of 2 inches of rigid glass-fiber insulation on inside of assembly. Adjustable, restrained-spring isolators shall be mounted on elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.
- E. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch thick.

- F. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 VIBRATION CONTROL DEVICE INSTALLATION**

- A. Coordinate the 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."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

**END OF SECTION 230548.13**

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND 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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Stencils.
  - 4. Warning tags.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.

### **PART 2 - PRODUCTS**

#### **2.1 EQUIPMENT LABELS**

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Letter Color: Coordinate color with owner..
  - 3. Background Color: Coordinate color with owner. .
  - 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-quarters 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.

**B. 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: Coordinate color with owner. Insert color.
3. Background Color: Coordinate color with owner..
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-quarters 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.

**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. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Coordinate color with owner..
- C. Background Color: Coordinate color with 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-quarters 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 STENCILS**

- A. Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:
  - 1. Lettering Size: Minimum letter height of 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
  - 2. Stencil Material: Brass.
  - 3. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
  - 4. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.

### **2.4 WARNING TAGS**

- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
  - 1. Size: 3 by 5-1/4 inches minimum.
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 4. Color: Safety-yellow background with black lettering.

## **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 GENERAL INSTALLATION REQUIREMENTS**

- 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.

**3.3 EQUIPMENT LABEL INSTALLATION**

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

**3.4 WARNING-TAG INSTALLATION**

- A. Write required message on, and attach warning tags to, equipment and other items where required.

**END OF SECTION 230553**

**SECTION 230593 - TESTING, ADJUSTING, AND BALANCING 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. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
    - b. Variable-air-volume systems.
  - 2. Balancing Hydronic Piping Systems:
    - a. Constant-flow hydronic systems.
  - 3. Testing, Adjusting, and Balancing Equipment:
    - a. Condensing units.
  - 4. Duct leakage tests.
  - 5. Control system verification.

**1.3 DEFINITIONS**

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

#### **1.4 PREINSTALLATION MEETINGS**

- A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
  - 1. Minimum Agenda Items:
    - a. The Contract Documents examination report.
    - b. The TAB plan.
    - c. Needs for coordination and cooperation of trades and subcontractors.
    - d. Proposed procedures for documentation and communication flow.

#### **1.5 ACTION SUBMITTALS**

- A. Sustainable Design Submittals:
  - 1. Air-Balance Report: Documentation indicating that Work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

#### **1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. 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.
- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.



## **1.7 QUALITY ASSURANCE**

- A. TAB Specialists Qualifications: Certified by AABC.
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
  - 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
  
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
  - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
  
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
  
- D. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
  
- E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

## **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 installed systems for 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 applicable for intended purpose and 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 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 verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. 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 the following:
  - 1. Equipment and systems to be tested.
  - 2. Strategies and step-by-step procedures for balancing the systems.
  - 3. Instrumentation to be used.
  - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:
  - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
  - b. Duct systems are complete with terminals installed.
  - c. Volume, smoke, and fire dampers are open and functional.
  - d. Clean filters are installed.
  - e. Fans are operating, free of vibration, and rotating in correct direction.
  - f. Variable-frequency controllers' startup is complete and safeties are verified.
  - g. Automatic temperature-control systems are operational.
  - h. Ceilings are installed.
  - i. Windows and doors are installed.
  - j. Suitable access to balancing devices and equipment is provided.
  
2. Hydronics:
  - a. Piping is complete with terminals installed.
  - b. Strainers are pulled and cleaned.
  - c. Control valves are functioning per the sequence of operation.
  - d. Shutoff and balance valves have been verified to be 100 percent open.
  - e. Suitable access to balancing devices and equipment is provided.

### **3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" 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. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
  3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping 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) 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. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "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. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    - b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses, close to the fan and prior to any outlets, to obtain total airflow.
    - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
  - 2. Measure fan static pressures as follows:

- a. Measure static pressure directly at the fan outlet or through the flexible connection.
  - b. Measure static pressure directly at the fan inlet or through the flexible connection.
  - c. Measure static pressure across each component that makes up the air-handling system.
  - d. Report artificial loading of filters at the time static pressures are measured.
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. 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 occurs. Measure amperage in full-cooling, full-heating, economizer, 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.
1. Measure airflow of submain and branch ducts.
  2. Adjust submain and branch duct volume dampers for specified airflow.
  3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  2. Measure inlets and outlets airflow.
  3. Adjust each inlet and outlet for specified airflow.
  4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
  2. Re-measure and confirm that total airflow is within design.
  3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
  4. Mark all final settings.
  5. Test system in economizer mode. Verify proper operation and adjust if necessary.
  6. Measure and record all operating data.
  7. Record final fan-performance data.

### **3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS**

- A. Adjust the variable-air-volume systems as follows:
1. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

- a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
  - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
  - c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
  - d. Adjust controls so that terminal is calling for minimum airflow.
  - e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
2. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
  - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
  - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
  - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

### **3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS**

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
  1. Check flow-control valves for proper position.

### **3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS**

- A. For systems with no diversity:
  1. Adjust flow-measuring devices installed in mains and branches to design water flows.

2. Adjust flow-measuring devices installed at terminals for each space to design water flows.
  - a. Measure flow at terminals.
  - b. Adjust each terminal to design flow.
  - c. Re-measure each terminal after it is adjusted.
  - d. Perform temperature tests after flows have been balanced.
3. For systems with pressure-independent valves at terminals:
  - a. Measure differential pressure and verify that it is within manufacturer's specified range.
  - b. Perform temperature tests after flows have been verified.
4. Prior to verifying final system conditions, determine the system differential-pressure set point.
5. Mark final settings and verify that all memory stops have been set.
6. Verify final system conditions as follows:
  - a. Re-measure and confirm that total water flow is within design.

### **3.9 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. Phase and hertz.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter size and thermal-protection-element rating.
  8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

### **3.10 PROCEDURES FOR CONDENSING UNITS**

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

### **3.11 DUCT LEAKAGE TESTS**

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report deficiencies observed.

### **3.12 CONTROLS VERIFICATION**

- A. In conjunction with system balancing, perform the following:
  - 1. Verify temperature control system is operating within the design limitations.
  - 2. Confirm that the sequences of operation are in compliance with Contract Documents.
  - 3. Verify that controllers are calibrated and function as intended.
  - 4. Verify that controller set points are as indicated.
  - 5. Verify the operation of lockout or interlock systems.
  - 6. Verify the operation of valve and damper actuators.
  - 7. Verify that controlled devices are properly installed and connected to correct controller.
  - 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
  - 9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

### **3.13 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
  - 2. Check the refrigerant charge.
  - 3. Check the condition of filters.
  - 4. Check the condition of coils.
  - 5. Check the operation of the drain pan and condensate-drain trap.
  - 6. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
  - 1. New filters are installed.



2. Coils are clean and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### **3.14 TOLERANCES**

- A. Set HVAC system's airflow 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.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

### **3.15 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.
  3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
  2. Manufacturers' test data.
  3. Field test reports prepared by system and equipment installers.
  4. 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 specialist.
  3. Project name.
  4. Project location.
  5. Architect's name and address.
  6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. 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.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  14. Notes to explain why certain final data in the body of reports vary from indicated values.
  15. Test conditions for fans 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. Fan drive settings including settings and percentage of maximum pitch diameter.
    - e. Settings for supply-air, static-pressure controller.
    - f. 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. Terminal units.
  5. Balancing stations.
- E. Air-Handling-Unit Test Reports: 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 airflow 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. Outdoor airflow in cfm.
    - g. Return airflow in cfm.
- F. Apparatus-Coil Test Reports:
  1. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm.
    - b. Air pressure drop in inches wg.
    - c. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    - d. Return-air, wet- and dry-bulb temperatures in deg F.
    - e. Entering-air, wet- and dry-bulb temperatures in deg F.
    - f. Leaving-air, wet- and dry-bulb temperatures in deg F.
    - g. Refrigerant expansion valve and refrigerant types.
    - h. Refrigerant suction pressure in psig.
    - i. Refrigerant suction temperature in deg F.
    - j. Inlet steam pressure in psig.
- G. Fan Test Reports: 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.
- H. 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 airflow rate in cfm.
    - h. Indicated velocity in fpm.
    - i. Actual airflow rate in cfm.
    - j. Actual average velocity in fpm.
    - k. Barometric pressure in psig.
  - I. Air-Terminal-Device Reports:
    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. Airflow rate in cfm.
  - b. Air velocity in fpm.
  - c. Preliminary airflow rate as needed in cfm.
  - d. Preliminary velocity as needed in fpm.
  - e. Final airflow rate in cfm.
  - f. Final velocity in fpm.
  - g. Space temperature in deg F.
- J. Instrument Calibration Reports:
1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### **3.16 VERIFICATION OF TAB REPORT**

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
- B. If 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."
- C. 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.
- D. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- E. Prepare test and inspection reports.

**3.17 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 230713 - DUCT 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 insulating the following duct services:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, concealed return located in unconditioned space.
  - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Sustainable Design Submittals:
  - 1. Product Data: For adhesives, indicating VOC content.
  - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
  - 3. Product Data: For coatings, indicating VOC content.
  - 4. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
  - 5. Product Data: For sealants, indicating VOC content.
  - 6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. 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 insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
  - 3. Detail application of field-applied jackets.
  - 4. Detail application at linkages of control devices.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### **1.5 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 according to ASTM E 84, 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.

#### **1.6 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.

#### **1.7 COORDINATION**

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.



## **1.8 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 "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum 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 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 Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
  - 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. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. K-Flex USA.
- 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 II with factory-applied vinyl jacket Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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. CertainTeed Corporation.
  - b. Johns Manville; a Berkshire Hathaway company.
  - c. Knauf Insulation.
  - d. Manson Insulation Inc.
  - e. Owens Corning.
  
- H. 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. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  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. CertainTeed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.
  
- I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
  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. Armacell LLC.
    - b. Nomaco Insulation.

## **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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  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. Aeroflex USA, Inc.
  - b. Armacell LLC.
  - c. Foster Brand; H. B. Fuller Construction Products.
  - d. K-Flex USA.
2. Adhesives shall have a VOC content of [50] <Insert value> g/L or less.
  3. Adhesive shall comply 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."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
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. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Adhesive shall comply 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."
- D. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### **2.3 MASTICS AND COATINGS**

- A. Materials shall be compatible with insulation materials, jackets, and substrates.
1. VOC Content: 300 g/L or less.
  2. Low-Emitting Materials: Mastic coatings shall comply 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."
- B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below ambient services.
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. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Knauf Insulation.
    - d. Vimasco Corporation.
  2. Water-Vapor Permeance: Comply with ASTM C 755, Section 7.2.2, Table 2, for insulation type and service conditions.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
  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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Knauf Insulation.
    - e. Mon-Eco Industries, Inc.
    - f. Vimasco Corporation.
  2. Water-Vapor Permeance: ASTM E 96, greater than 1.0 perm at manufacturer's recommended dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Color: White.

## **2.4 LAGGING ADHESIVES**

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
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. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Vimasco Corporation.
  2. Adhesives shall have a VOC content of 50 g/L or less.
  3. Adhesive shall comply 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."
  4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
  5. Service Temperature Range: 0 to plus 180 deg F.
  6. Color: White.

## **2.5 SEALANTS**

- A. FSK and Metal Jacket Flashing Sealants:
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. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Mon-Eco Industries, Inc.
  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.
  6. Sealant shall have a VOC content of 420 g/L or less.
  7. Sealant shall comply 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."

## **2.6 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. 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. 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. Polyguard Products, Inc.

## **2.7 TAPES**

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  - 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. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  - 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.

## **2.8 SECUREMENTS**

- A. Bands:

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. ITW Insulation Systems; Illinois Tool Works, Inc.
    - b. RPR Products, Inc.
  2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with closed seal.
  3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.
  4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
    - 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) AGM Industries, Inc.
      - 2) Gemco.
      - 3) Hardcast, Inc.
      - 4) Midwest Fasteners, Inc.
      - 5) Nelson Stud Welding.
  2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
    - 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) AGM Industries, Inc.
      - 2) CL WARD & Family Inc.
      - 3) Gemco.
      - 4) Hardcast, Inc.
      - 5) Midwest Fasteners, Inc.
      - 6) Nelson Stud Welding.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, galvanized steel.

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. C & F Wire.

## **2.9 CORNER ANGLES**

- A. 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.
- B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 .

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### **3.3 GENERAL INSTALLATION REQUIREMENTS**

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. 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.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. 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. 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, according to 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 duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- N. 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.

### **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 Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: 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.
  - 1. Comply with requirements in Section 078413 "Penetration Firestopping."
- D. Insulation Installation at Floor Penetrations:
  - 1. Duct: 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. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### **3.5 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.

### **3.6 INSTALLATION OF MINERAL-FIBER INSULATION**

- 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 one edge and one 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 two 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. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
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 one edge and one 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 two 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. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  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.

### **3.7 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; 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.
- 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.

### **3.8 FINISHES**

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

### **3.9 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. Inspect ductwork, 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 one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### **3.10 DUCT INSULATION SCHEDULE, GENERAL**

- A. Plenums and Ducts Requiring Insulation:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, concealed return located in unconditioned space.
  - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
- B. Items Not Insulated:
  - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
  - 2. Factory-insulated flexible ducts.
  - 3. Factory-insulated plenums and casings.
  - 4. Flexible connectors.
  - 5. Vibration-control devices.
  - 6. Factory-insulated access panels and doors.

### **3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE**

- A. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:
  - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
  - 2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
  - 3. Polyolefin: 1 inch thick.
- B. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:
  - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
  - 2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
  - 3. Polyolefin: 1 inch thick.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

E. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

F. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

G. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 6-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

### **3.12 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.

B. Exposed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 6-lb/cu. ft. nominal density.

**3.13 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.
  - 2. Insert jacket type.
- D. Ducts and Plenums, Exposed:
  - 1. None.
  - 2. .

**3.14 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, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
  - 1. Aluminum, Smooth: 0.020 inch thick.

**END OF SECTION 230713**



## **SECTION 230719 - HVAC PIPING 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 insulation for HVAC piping systems.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Sustainable Design Submittals:
  - 1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
  - 2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.
- C. 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 insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
- D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.
  - 1. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.

- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

### **1.5 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.

### **1.6 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.

### **1.7 COORDINATION**

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC 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.

## **1.8 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. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials, Type II for sheet materials.
  - 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. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. K-Flex USA.
- G. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

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. Johns Manville; a Berkshire Hathaway company.
  - b. Knauf Insulation.
  - c. Manson Insulation Inc.
  - d. Owens Corning.
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.

## **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. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.
  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. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. K-Flex USA.
  2. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of 80 g/L or less.
  3. Adhesive shall comply 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."
  4. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less as tested in accordance with ASTM E84.
  5. Wet Flash Point: Below 0 deg F.
  6. Service Temperature Range: 40 to 200 deg F.
  7. Color: Black.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

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. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Mon-Eco Industries, Inc.
  2. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.
  3. Adhesive shall comply 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."
- D. 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. 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. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Mon-Eco Industries, Inc.
  2. Adhesives shall have a VOC content of 50 g/L or less.
  3. Adhesive shall comply 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."
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
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. Dow Corning Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. P.I.C. Plastics, Inc.
    - d. Speedline Corporation.
  2. Adhesive: As recommended by Adhesive - PVC Jacket manufacturer and with a VOC content of 50 g/L or less.

3. Adhesive shall comply 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."

### **2.3 SEALANTS**

- A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.
- B. ASJ Flashing Sealants and PVDC and PVC Jacket Flashing Sealants:
  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. Childers Brand; H. B. Fuller Construction Products.
  2. Fire- and water-resistant, flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 40 to plus 250 deg F.
  4. Color: White.
  5. Sealant shall have a VOC content of 420 g/L or less.
  6. Sealant shall comply 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."

### **2.4 FIELD-APPLIED JACKETS**

- A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.
- B. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Airex Manufacturing.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. P.I.C. Plastics, Inc.
    - d. Proto Corporation.
    - e. Speedline Corporation.

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.
- C. 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 cross-laminated polyethylene film covered with white aluminum-foil facing.

## **2.5 TAPES**

- A. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. 3M Industrial Adhesives and Tapes Division.
    - b. Ideal Tape Co., Inc., an American Biltrite Company.
  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.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 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.

### **3.3 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. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. 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.
- O. 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.

### **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 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.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

- D. 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.
- E. 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."

### **3.5 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 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. 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 to fit. 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.

### **3.6 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 FIELD-APPLIED JACKET INSTALLATION**

- A. Where PVC jackets are indicated and for horizontal applications, 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.

### **3.9 FINISHES**

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless steel jackets.

### **3.10 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.

### **3.11 INDOOR PIPING INSULATION SCHEDULE**

- A. Condensate and Equipment Drain Water below 60 Deg F:
  - 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.
- B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
  - 1. NPS 12 and Smaller: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.
- C. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1 inch thick.
- D. Refrigerant Suction and Hot-Gas Flexible Tubing:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1 inch thick.
- E. Refrigerant Liquid Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1 inch thick.

### **3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 2 inches thick.
- B. Refrigerant Suction and Hot-Gas Flexible Tubing:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 2 inches thick.

- C. Refrigerant Liquid Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 2 inches thick.

**3.13 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. Piping, Exposed:
  - 1. PVC: 30 mils thick.

**END OF SECTION 230719**

## **SECTION 231123 - 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. Manual gas shutoff valves.
  - 5. Pressure regulators.
  - 6. Dielectric fittings.

#### **1.3 DEFINITIONS**

- A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. 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.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of the following:
  - 1. Piping specialties.
  - 2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - 3. Pressure regulators. Indicate pressure ratings and capacities.
  - 4. Dielectric fittings.



- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
  - 1. Shop Drawing Scale: 1/4 inch per foot.
  - 2. Detail mounting, supports, and valve arrangements for[ service meter assembly and] pressure regulator assembly.

### **1.5 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. Qualification Data: For qualified professional engineer.
- C. Welding certificates.
- D. Field quality-control reports.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

### **1.7 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.

### **1.8 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.
- D. Protect stored PE pipes and valves from direct sunlight.

### **1.9 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.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of natural-gas service.
  - 2. Do not proceed with interruption of natural-gas service without Owner's written permission.

### **1.10 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 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.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

## **2.2 PIPES, TUBES, AND FITTINGS**

- A. Steel Pipe: ASTM A53/A53M, 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 A234/A234M 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. Mechanical 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) GE Oil & Gas.
      - 2) Smith-Blair, Inc.
    - b. Stainless-steel flanges and tube with epoxy finish.
    - c. Buna-nitrile seals.
    - d. Stainless-steel bolts, washers, and nuts.
    - e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    - f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
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. FlashShield Products; Gastite, a division of Titeflex Corp.
    - b. TracPipe CounterStrike; Omega Flex, Inc.
    - c. Tru-Flex Metal Hose Corp.
    - d. Ward Manufacturing LLC.

2. Tubing: ASTM A240/A240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.
  - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 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.
4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.

## **2.3 PIPING SPECIALTIES**

### **A. Appliance Flexible Connectors:**

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
3. Corrugated stainless-steel tubing with polymer coating.
4. Operating-Pressure Rating: 0.5 psig.
5. End Fittings: Zinc-coated steel.
6. Threaded Ends: Comply with ASME B1.20.1.
7. Maximum Length: 72 inches

## **2.4 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.

## **2.5 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. 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 Co.; a Masco company.
  - b. Lyall, R. W. & Company, Inc.
  - c. Perfection Corporation.
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.

D. 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. A.Y. McDonald Mfg. Co.
  - b. Lee Brass Company.
2. Body: Bronze, complying with ASTM B584.
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.

E. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. A.Y. McDonald Mfg. Co.
  - b. Mueller Co.
  - c. Xomox Corporation.
2. Body: Cast iron, complying with ASTM A126, 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.

F. 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. A.Y. McDonald Mfg. Co.
  - b. Flowserve Corporation.
  - c. Homestead Valve.
  - d. Milliken Valve Company.
  - e. Mueller Co.
  - f. R & M Energy Systems; Robbins & Myers.
2. Body: Cast iron, complying with ASTM A126, 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.

## **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. Eclipse Innovative Thermal Technologies.
  - b. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
  - c. Invensys.
  - d. Maxitrol Company.
  - e. Richards Industries.
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: 2 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. 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. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. HART Industrial Unions, LLC.
    - d. Jomar Valve.
    - e. Matco-Norca.
    - f. WATTS.
    - g. Wilkins.
    - h. Zurn Industries, LLC.
  
  - 2. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 125 psig minimum at 180 deg F.
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.

## **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 fittings for changes in direction and branch connections.
- D. Install pressure gage [**downstream**] [**upstream and downstream**] from each service regulator. Pressure gages are specified in Section 230519 "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. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
  - 2. 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.
  - 3. 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 sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

### **3.5 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.

### **3.6 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 D2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
  2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### **3.7 HANGER AND SUPPORT INSTALLATION**

- A. 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 steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for corrugated stainless-steel tubing, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within 12 inches of each fitting.
- F. Support vertical runs of steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

- G. Support vertical runs of corrugated stainless-steel tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### **3.8 CONNECTIONS**

- A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 12 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### **3.9 LABELING AND IDENTIFYING**

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

### **3.10 PAINTING**

- A. 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 (flat) or (semigloss).
    - d. Color: Gray.
- B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

### **3.11 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.

### **3.12 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

### **3.13 OUTDOOR PIPING SCHEDULE**

- A. Underground natural-gas piping shall be one of the following:
  1. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
- 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.

### **3.14 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.

### **3.15 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. Bronze plug valve.
- B. 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. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be one of the following:
1. One-piece, bronze ball valve with bronze trim.
  2. Bronze plug valve.

**END OF SECTION 231123**

## **SECTION 232113 - HYDRONIC 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. Plastic pipe and fittings.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of the following:
  - 1. Pipe and tube.
  - 2. Fittings.
  - 3. Joining materials.
- B. Sustainable Design Submittals:
  - 1. Product Data: For adhesives, indicating VOC content.
  - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Piping layout, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Qualification Data: For Installer.
- C. Field quality-control reports.



## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
  - 1. Hot-Water Heating Piping: 100 psig at 200 deg F.
  - 2. Condensate-Drain Piping: 150 deg F.

### **2.2 COPPER TUBE AND FITTINGS**

- A. Drawn-Temper Copper Tube: ASTM B88, Type L and ASTM B88, Type M.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- C. Wrought Copper Unions: ASME B16.22.
- D. Copper-Tube, Pressure-Seal-Joint Fittings:
  - 1. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
  - 2. Minimum 200-psig working-pressure rating at 250 deg F.

### **2.3 PLASTIC PIPE AND FITTINGS**

- A. PVC Plastic Pipe: ASTM D1785, with wall thickness as indicated in "Piping Applications" Article.
  - 1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D2466 for Schedule 40 pipe; ASTM D2467 for Schedule 80 pipe.

### **2.4 JOINING MATERIALS**

- A. 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 otherwise 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.

- B. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- D. Solvent Cements for PVC Piping: ASTM D2564. Include primer according to ASTM F656.
  - 1. Solvent cement shall have a VOC content of 510 g/L or less.
  - 2. Adhesive primer shall have a VOC content of 550 g/L or less.
  - 3. Adhesive shall comply 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."

### **PART 3 - EXECUTION**

#### **3.1 PIPING APPLICATIONS**

- A. Hot-water heating piping, aboveground, [NPS 2 and smaller] <Insert pipe size range>, shall be[ any of] the following:
  - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazedor pressure-seal joints.
- B. Condensate-Drain Piping, PVC: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

#### **3.2 INSTALLATION OF PIPING**

- A. 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.
- 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. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC 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 pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- D. 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/A5.8M.

- 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. Plastic Piping Solvent-Cemented 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.
  - 2. PVC Pressure Piping: Join ASTM D1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D2855.
  - 3. PVC Nonpressure Piping: Join according to ASTM D2855.
- G. Pressure-Sealed Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

### **3.4 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.
- B. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support vertical runs of fiberglass piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### **3.5 FIELD QUALITY CONTROL**

- A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
  2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
  3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
  4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
  5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following before operating the system:
1. Open manual valves fully.
  2. Inspect pumps for proper rotation.
  3. Set makeup pressure-reducing valves for required system pressure.
  4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
  5. Set temperature controls so all coils are calling for full flow.
  6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
  7. Verify lubrication of motors and bearings.

**END OF SECTION 232113**

## **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 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Refrigerant pipes and fittings.
  - 2. Refrigerants.

#### **1.3 ACTION SUBMITTALS**

- A. Sustainable Design Submittals:
  - 1. Product Data: For refrigerants, indicating compliance with refrigerant management practices.
- B. Shop Drawings:
  - 1. 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.
  - 2. Show piping size and 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.
  - 3. Show interface and spatial relationships between piping and equipment.
  - 4. Shop Drawing Scale: 1/4 inch equals 1 foot.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

## **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

## **1.6 PRODUCT STORAGE AND HANDLING**

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

## **PART 2 - PRODUCTS**

### **2.1 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.

### **2.2 COPPER TUBE AND FITTINGS**

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Brazing Filler Metals: AWS A5.8/A5.8M.
- E. Flexible Connectors:
  - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
  - 2. End Connections: Socket ends.
  - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
  - 4. Working Pressure Rating: Factory test at minimum 500 psig.
  - 5. Maximum Operating Temperature: 250 deg F.

### **2.3 REFRIGERANTS**

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.
  - 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. Arkema Inc.
    - b. DuPont Fluorochemicals Div.
    - c. Genetron Refrigerants; Honeywell International Inc.
    - d. Mexichem Fluor Inc.

## **PART 3 - EXECUTION**

### **3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A**

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:
  - 1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
  - 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

### **3.2 VALVE AND SPECIALTY APPLICATIONS**

- A. Install all valves and accessories recommended by the manufacturers installation instructions. .

### **3.3 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 Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.



- 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 adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Install refrigerant piping in protective conduit where installed belowground.
- L. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- M. 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.
- N. When brazing or soldering, 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.
- O. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

### **3.4 PIPE 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 pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
  - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

### **3.5 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.
- B. 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 Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  - 4. Spring hangers to support vertical runs.
  - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping within 12 inches of each fitting.
- E. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### **3.6 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
  - a. Fill system with nitrogen to the required test pressure.
  - b. System shall maintain test pressure at the manifold gage throughout duration of test.
  - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
  - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

### **3.7 SYSTEM CHARGING**

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 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.

### **3.8 ADJUSTING**

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning 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. Verify that compressor oil level is correct.
  3. Open compressor suction and discharge valves.
  4. Open refrigerant valves except bypass valves that are used for other purposes.
  5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

**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 ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

- B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

#### **1.3 DEFINITIONS**

- A. OSHPD: Office of Statewide Health Planning and Development (State of California).

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

- B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. 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.
4. Elevation of top and bottom of ducts.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
11. Hangers and supports, including methods for duct and building attachment[, seismic restraints,] and vibration isolation.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Welding certificates.
- C. Field quality-control reports.

## **1.6 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  1. [AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.]

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- D. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

## **2.2 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.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Transverse Joints: Fabricate joints in accordance with 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."
  - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with 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." [ All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.]
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 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."

## **2.3 SINGLE-WALL ROUND[ AND FLAT-OVAL] DUCTS AND FITTINGS**

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.

2. 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. Ductmate Industries, Inc.
  - b. Elgen Manufacturing.
  - c. Linx Industries (formerly Lindab).
  - d. McGill AirFlow LLC.
  - e. MKT Metal Manufacturing.
  - f. Nordfab Ducting.
  - g. SEMCO LLC.
  - h. Set Duct Manufacturing.
  - i. Sheet Metal Connectors, Inc.
  - j. Spiral Manufacturing Co., Inc.
  - k. Stamped Fittings Inc.
- B. 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."
- C. 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."
- D. 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."

## **2.4 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. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. 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.

## **2.5 DUCT LINER**

- A. Fiberglass-Free Duct Liner: Made from partially recycled cotton or polyester products and containing no fiberglass. Airstream surface overlaid with fire-resistant facing to prevent surface erosion by airstream, complying with NFPA 90A or NFPA 90B. Treat natural-fiber products with antimicrobial coating.
  - 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. Acoustical Surfaces, Inc.
    - b. Bonded Logic, Inc.
    - c. Ductmate Industries, Inc.
  - 2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature when tested in accordance with ASTM C 518.
  - 3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with ASTM E 84; certified by an NRTL.
  - 4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
    - a. Adhesive shall have a VOC content of 80 g/L or less.
    - b. Adhesive shall comply 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."
- B. Insulation Pins and Washers:
  - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  3. Butt transverse joints without gaps, and coat joint with adhesive.
  4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
  5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
  6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm or greater.
  7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
  8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    - a. Fan discharges.
    - b. Intervals of lined duct preceding unlined duct.
    - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
  9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## **2.6 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 in accordance with UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  2. Tape Width: 4 inches.

3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  
10. Sealant shall have a VOC content of 420 g/L or less.
11. Sealant shall comply 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."

C. 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.

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.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply 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."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.

2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## **2.7 HANGERS AND SUPPORTS**

- A. Hanger Rods for Noncorrosive Environments: Galvanized-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 Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. 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 in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.

- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. 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.
- J. Install fire and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation.
- M. Elbows: Use long-radius elbows wherever they fit.
  - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
  - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- N. Branch Connections: Use lateral or conical branch connections.

### **3.2 DUCT SEALING**

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

### **3.3 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.
- C. Hanger Spacing: 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," 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.

### **3.4 CONNECTIONS**

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### **3.5 PAINTING**

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### **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 totaling no less than 50 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 totaling no less than 50 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. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
  - 5. Test for leaks before applying external insulation.
  - 6. 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.
  - 7. Give [seven] <Insert number> 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 in accordance with "Description of Method 3 - NADCA 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 DUCT CLEANING**

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use duct cleaning methodology as indicated in NADCA ACR.
- C. Use service openings for entry and inspection.
  1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
  2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  3. Remove and reinstall ceiling to gain access during the cleaning process.
- D. Particulate Collection and Odor Control:
  1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- E. Clean the following components by removing surface contaminants and deposits:
  1. Air outlets and inlets (registers, grilles, and diffusers).
  2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  4. Coils and related components.
  5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  6. Supply-air ducts, dampers, actuators, and turning vanes.
  7. Dedicated exhaust and ventilation components and makeup air systems.
- F. Mechanical Cleaning Methodology:



1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

### **3.8 STARTUP**

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

### **3.9 DUCT SCHEDULE**

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
  1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
- B. Supply Ducts:
  1. Ducts Connected to Constant-Volume Air-Handling Units and Heat Pumps :
    - a. Pressure Class: Positive 3- inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 8.
    - d. SMACNA Leakage Class for Round and Flat Oval: 8.
  2. Ducts Connected to Variable-Air-Volume Air-Handling Units <Insert equipment>:
    - a. Pressure Class: Positive 3- inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 8.
    - d. SMACNA Leakage Class for Round and Flat Oval: 8.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
  - a. Pressure Class: Positive or negative 2- inch wg.
  - b. Minimum SMACNA Seal Class: A.
  - c. SMACNA Leakage Class for Rectangular: 8.
  - d. SMACNA Leakage Class for Round and Flat Oval: 8.
2. Ducts Connected to Air-Handling Units & Heat Pumps :
  - a. Pressure Class: Positive or negative 2- inch wg.
  - b. Minimum SMACNA Seal Class: A.
  - c. SMACNA Leakage Class for Rectangular: 8.
  - d. SMACNA Leakage Class for Round and Flat Oval: 8.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
  - a. Pressure Class: Negative [1-] [2-] [3-] <Insert number>inch wg.
  - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
  - c. SMACNA Leakage Class for Rectangular: 8.
  - d. SMACNA Leakage Class for Round and Flat Oval: 8.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or Galvanized steel or carbon steel coated with zinc-chromate primer.

F. Liner:

1. Supply-Air Ducts: Natural fiber, 1 inch(es) thick.
2. Return-Air Ducts: Natural fiber, 1 inch(es) thick.

G. Elbow Configuration:

1. 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. 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) 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.
- H. 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: Conical 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 and Supplementary Conditions and Division 01 Specification Sections, apply to 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. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Duct accessory hardware.

- B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

- 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. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor-damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

- e. Duct security bars.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling plans, or BIM model, 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.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

#### **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. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Comply with NFPA 90A and NFPA 90B.
- B. 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.

#### **2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS**

- 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. American Warming and Ventilating; a Mestek Architectural Group company.
  - 2. Cesco Products; a division of MESTEK, Inc.
  - 3. Greenheck Fan Corporation.
  - 4. Lloyd Industries, Inc.
  - 5. Nailor Industries Inc.
  - 6. NCA Manufacturing, Inc.

7. Pottorff.
  8. Ruskin Company.
  9. Safe Air - Dowco Products.
  10. United Enertech.
  11. Vent Products Co., Inc.
- B. Description: Gravity balanced.
- C. Performance:
1. Maximum Air Velocity: 1000 fpm.
  2. Maximum System Pressure: 3 inches wg .
- D. Construction:
1. Frame:
    - a. Hat shaped.
    - b. 0.093-inch- thick extruded aluminum, with welded or mechanically attached corners[ and mounting flange].
  2. Blades:
    - a. End pivoted, maximum 6-inch width, 0.050-inch- thick aluminum sheet with sealed edges.
  3. Blade Action: Parallel.
- E. Blade Seals: Neoprene, mechanically locked.
- F. Blade Axles:
1. Material: Stainless steel.
  2. Diameter: 0.20 inch.
- G. Tie Bars and Brackets: Aluminum.
- H. Return Spring: Adjustable tension.
- I. Bearings: Steel ball.
- J. Damper Actuator - Electric:
1. Electric - 120 V ac.
  2. UL 873 plenum rated.
  3. Two position.
    - a. Sufficient motor torque to drive damper fully closed with adequate force to achieve required damper seal.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:
  - a. Temperature: Minus 40 to plus 130 deg F.
  - b. Humidity: 5 to 95 percent relative humidity noncondensing.
6. Environmental Enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Chain pulls.
4. Screen Mounting:
  - a. Front mounted in sleeve.
    - 1) Sleeve Thickness: 20 gauge minimum.
5. Screen Material: Aluminum.
6. Screen Type: Bird.
7. 90-degree stops.

## 2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

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. Air Balance; a division of MESTEK, Inc.
  - b. Aire Technologies.
  - c. American Warming and Ventilating; a Mestek Architectural Group company.
  - d. Arrow United Industries.
  - e. Cesco Products; a division of MESTEK, Inc.
  - f. Greenheck Fan Corporation.
  - g. Lloyd Industries, Inc.
  - h. McGill AirFlow LLC.
  - i. Nailor Industries Inc.
  - j. Pottorff.
  - k. Ruskin Company.
  - l. Safe Air - Dowco Products.
  - m. United Enertech.
  - n. Vent Products Co., Inc.

2. Performance:
  - a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.
3. Construction:
  - a. Linkage out of airstream.
  - b. Suitable for horizontal or vertical airflow applications.
4. Frames:
  - a. Hat-shaped, 18-gauge- thick stainless steel.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized steel; 16 gauge thick.
6. Blade Axles: Stainless steel.
7. Bearings:
  - a. Stainless steel sleeve.
  - b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.
8. Tie Bars and Brackets: Galvanized steel.

## **2.4 CONTROL DAMPERS**

- 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. American Warming and Ventilating; a Mestek Architectural Group company.
  2. Arrow United Industries.
  3. Carnes Company.
  4. Cesco Products; a division of MESTEK, Inc.
  5. Greenheck Fan Corporation.
  6. Lloyd Industries, Inc.
  7. McGill AirFlow LLC.
  8. Metal Form Manufacturing, Inc.
  9. Nailor Industries Inc.
  10. NCA Manufacturing, Inc.



11. Pottorff.
12. Ruskin Company.
13. Safe Air - Dowco Products.
14. United Enertech.
15. Vent Products Co., Inc.
16. Young Regulator Company.

B. General Requirements:

1. Unless otherwise indicated, use parallel-blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed-blade configuration.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

C. Performance:

1. Leakage:
  - a. Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.
2. Pressure Drop: 0.05 inch wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.

D. Construction:

1. Suitable for horizontal or vertical airflow applications.
2. Frames:
  - a. Hat, U, or angle shaped.
  - b. 18-gauge- thick stainless steel.
  - c. Mitered and welded corners.
  - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
3. Blades:
  - a. Multiple blade with maximum blade width of 6 inches.
  - b. Parallel and Opposed-blade design.
  - c. Aluminum.
  - d. 16-gauge- thick single skin or 14-gauge- thick air foil dual skin.
4. Blade Edging Seals:
  - a. Inflatable seal blade edging, or replaceable rubber seals.
5. Blade Axles: 1/2-inch diameter; [galvanized] [stainless] steel.
6. Bearings:

- a. Oil-impregnated stainless steel sleeve.

## **2.5 FIRE DAMPERS**

- 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. Air Balance; a division of MESTEK, Inc.
  2. Aire Technologies.
  3. Arrow United Industries.
  4. Cesco Products; a division of MESTEK, Inc.
  5. CL WARD & Family Inc.
  6. Greenheck Fan Corporation.
  7. NCA Manufacturing, Inc.
  8. Pottorff.
  9. Prefco.
  10. Ruskin Company.
  11. Safe Air - Dowco Products.
  12. United Enertech.
  13. Vent Products Co., Inc.
- B. Type: dynamic; rated and labeled in accordance with UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000 fpm velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed galvanized steel; with mitered and interlocking corners; gauge in accordance with UL listing.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel; gauge in accordance with UL listing.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed galvanized sheet steel, [interlocking] [full-length steel blade connectors]. Material gauge is to be in accordance with UL listing.
- I. Horizontal Dampers: Include blade lock and stainless steel closure spring.
- J. Heat-Responsive Device:
  1. Replaceable, 165 deg F rated, fusible links.

## **2.6 FLANGE CONNECTORS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. CL WARD & Family Inc.
  2. Ductmate Industries, Inc.
  3. DynAir; a Carlisle Company.
  4. Elgen Manufacturing.
  5. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Description: roll-formed, factory fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gauge and Shape: Match connecting ductwork.

## **2.7 TURNING VANES**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Aero-Dyne Sound Control Co.
  2. CL WARD & Family Inc.
  3. Ductmate Industries, Inc.
  4. Duro Dyne Inc.
  5. DynAir; a Carlisle Company.
  6. Elgen Manufacturing.
  7. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Fabricate 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. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- D. Vane Construction:

1. Single wall.
2. Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

## **2.8 DUCT-MOUNTED ACCESS DOORS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. Aire Technologies.
2. Arrow United Industries.
3. Cesco Products; a division of MESTEK, Inc.
4. CL WARD & Family Inc.
5. Ductmate Industries, Inc.
6. Duro Dyne Inc.
7. Elgen Manufacturing.
8. Flexmaster U.S.A., Inc.
9. McGill AirFlow LLC.
10. Ruskin Company.
11. United Enertech.
12. Ventfabrics, Inc.
13. Ward Industries; a brand of Hart & Cooley, Inc.

- B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:
  - a. Double wall, rectangular.
  - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
  - c. Vision panel.
  - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
  - e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, 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.

## **2.9 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. CL WARD & Family Inc.
  2. Ductmate Industries, Inc.
  3. Duro Dyne Inc.
  4. DynAir; a Carlisle Company.
  5. Elgen Manufacturing.
  6. Ventfabrics, Inc.
  7. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.
- C. Materials: Flame-retardant or noncombustible fabrics.
- D. Coatings and Adhesives: Comply with UL 181, Class 1.
- E. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two 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.
- F. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 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.
- G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 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.

## **2.10 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.

## **2.11 MATERIALS**

- A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. 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.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 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 dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. 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 steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.
- G. Install fire and smoke dampers in accordance with UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
  2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
  3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  4. At each change in direction and at maximum 50-ft. spacing.
  5. Upstream and downstream from turning vanes.
  6. Control devices requiring inspection.
  7. Elsewhere as indicated.
- 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.
  3. Head and Hand Access: 18 by 10 inches.
  4. Head and Shoulders Access: 21 by 14 inches.
  5. Body Access: 25 by 14 inches.
  6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Install duct test holes where required for testing and balancing purposes.

### **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 size and location of access doors are adequate to perform required operation.
  3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and that proper heat-response device is installed.
  4. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**END OF SECTION 233300**



## **SECTION 233346 - FLEXIBLE 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. Insulated flexible ducts.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
  - 1. Product data showing compliance with ASHRAE 62.1.
  - 2. Product Data: For adhesives and sealants, indicating VOC content.
  - 3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
  - 4. Laboratory Test Reports: For Insulation, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For flexible ducts.
  - 1. Include plans showing locations and mounting and attachment details.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. 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.

## **PART 2 - PRODUCTS**

### **2.1 ASSEMBLY DESCRIPTION**

- 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 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.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

### **2.2 INSULATED FLEXIBLE DUCTS**

- 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. Flexmaster U.S.A., Inc.
  - 2. JP Lamborn Co..
  - 3. McGill AirFlow LLC.
  - 4. Thermaflex; a Flex-Tek Group company.
  - 5. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethyleneoraluminized vapor-barrier film.
  - 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.
  - 3. Temperature Range: Minus 20 to plus 175 deg F.
  - 4. Insulation R-Value: Comply with ASHRAE/IES 90.1.
- C. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethyleneor aluminized vapor-barrier film.
  - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.
  - 3. Temperature Range: Minus 20 to plus 210 deg F.
  - 4. Insulation R-Value: Comply with ASHRAE/IES 90.1.

- D. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylenor aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
  2. Maximum Air Velocity: 4000 fpm.
  3. Temperature Range: Minus 20 to plus 210 deg F.
  4. Insulation R-Value: Comply with ASHRAE/IES 90.1.

### **2.3 FLEXIBLE DUCT CONNECTORS**

- A. 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.
- B. Non-Clamp Connectors: Adhesive plus sheet metal screws.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install flexible ducts 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 in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- D. Connect flexible ducts to metal ducts with draw bands.
- E. Install duct test holes where required for testing and balancing purposes.
- F. Installation:
1. Install ducts fully extended.
  2. Do not bend ducts across sharp corners.
  3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
  4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
  5. Install flexible ducts in a direct line, without sags, twists, or turns.
- G. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

**END OF SECTION 233346**

## **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. Section Includes:
  - 1. Ceiling-mounted ventilators.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Rated capacities, operating characteristics, and furnished specialties and accessories.
  - 2. Certified fan performance curves with system operating conditions indicated.
  - 3. Certified fan sound-power ratings.
  - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 5. Material thickness and finishes, including color charts.
  - 6. Dampers, including housings, linkages, and operators.
  - 7. Prefabricated roof curbs.
- B. Shop Drawings:
  - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Include diagrams for power, signal, and control wiring.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, or BIM model, drawn to scale, showing the items described in this Section and coordinated with all building trades.
- B. Field quality-control reports.

## **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

## **1.6 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. Belts: One set(s) for each belt-driven unit.

## **PART 2 - PRODUCTS**

### **2.1 CEILING-MOUNTED VENTILATORS**

- 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. Greenheck Fan Corporation.
  - 2. Loren Cook Company.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.
- D. Back-draft damper: Integral.
- E. Grille: Aluminum, louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.
- F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- G. Accessories:
  - 1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
  - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
  - 3. Isolation: Rubber-in-shear vibration isolators.
  - 4. Acme Engineering & Manufacturing Corp.
  - 5. Aerovent; a division of Twin City Fan Companies, Ltd.

## **2.2 MOTORS**

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC 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.

## **2.3 SOURCE QUALITY CONTROL**

- 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. Fan Sound Ratings: Comply with AMCA 311, and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.
- C. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.
- D. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF HVAC POWER VENTILATORS**

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
  - 1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- C. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548.13 "Vibration Controls for HVAC."
- D. Install units with clearances for service and maintenance.

- E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

### **3.2 DUCTWORK CONNECTIONS**

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

### **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, according to NFPA 70 and NECA 1.
  - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
  - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

### **3.4 CONTROL CONNECTIONS**

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

### **3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
  - 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 there is adequate maintenance and access space.
  4. Verify that cleaning and adjusting are complete.
  5. 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.
  6. Adjust belt tension.
  7. Adjust damper linkages for proper damper operation.
  8. Verify lubrication for bearings and other moving parts.
  9. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  10. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  11. Shut unit down and reconnect automatic temperature-control operators.
  12. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### **3.6 ADJUSTING**

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

**END OF SECTION 233423**

## **SECTION 233600 - AIR TERMINAL UNITS**

### **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. Modulating, single-duct air terminal units.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of air terminal unit.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For air terminal units.
  - 1. Include plans, elevations, sections, and mounting 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.
  - 4. Hangers and supports, including methods for duct and building attachment and vibration isolation.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
  - 2. Size and location of initial access modules for acoustic tile.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

### **2.2 MODULATING, SINGLE-DUCT AIR TERMINAL UNITS**

- 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. Carrier Corporation; a unit of United Technologies Corp.
  2. Price Industries.
  3. Titus.
  4. Trane.
- B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: 0.040-inch- thick galvanized steel, single wall.
  1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
  2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
  3. Air Outlet: S-slip and drive connections.
  4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
  5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 rated, 3 percent of nominal airflow at 3-inch wg inlet static pressure.
  2. Damper Position: Normally closed.
- E. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve. Provide hydronic heating coils for air terminal units scheduled on Drawings.
- F. Control devices shall be compatible with temperature controls system.
1. Electric Damper Actuator: 24 V, powered open, spring return.
  2. Electric Thermostat: Wall-mounted electronic type with clock display, temperature display in Fahrenheit and Celsius, and space temperature set point.
  3. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
    - a. Occupied and unoccupied operating mode.
    - b. Remote reset of airflow or temperature set points.
    - c. Adjusting and monitoring with portable terminal.
    - d. Communication with temperature-control system.
- G. Controls:
1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg inlet static pressure.
  2. System-powered, wall-mounted thermostat.

## **2.3 SOURCE QUALITY CONTROL**

- A. Factory Tests: Test assembled air terminal units according to AHRI 880.
1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, [**coil type**, ]and AHRI certification seal.

## **PART 3 - EXECUTION**

### **3.1 HANGER AND SUPPORT INSTALLATION**

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

- 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 and for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. 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.

### **3.2 TERMINAL UNIT INSTALLATION**

- A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- C. Install wall-mounted thermostats.

### **3.3 PIPING CONNECTIONS**

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
- B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

### **3.4 DUCTWORK CONNECTIONS**

- A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

- B. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

### **3.5 ELECTRICAL CONNECTIONS**

- A. Install field power to each air terminal unit electrical power connection. Coordinate with air terminal unit manufacturer and installers.
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- E. 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."
  - 2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

### **3.6 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."

### **3.7 IDENTIFICATION**

- A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

### **3.8 STARTUP SERVICE**

- A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

**END OF SECTION 233600**

## **SECTION 233713.13 - AIR DIFFUSERS**

### **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. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.

- B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

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 Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.



- B. Source quality-control reports.

## **PART 2 - PRODUCTS**

### **2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS**

- 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. Anemostat Products; a Mestek company.
  - 2. Krueger.
  - 3. METALAIRE, Inc.
  - 4. Nailor Industries Inc.
  - 5. Price Industries.
  - 6. Titus.
  - 7. Tuttle & Bailey.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel or [Aluminum].
- D. Finish: Baked enamel, color selected by Architect.
- E. Mounting: Surface.
- F. Pattern: Fixed.
- G. Dampers: Radial opposed blade or Butterfly.

### **2.2 PERFORATED DIFFUSERS**

- 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. A-J Manufacturing Co., Inc.
  - 2. Krueger.
  - 3. Price Industries.
  - 4. Titus.
  - 5. Tuttle & Bailey.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel backpan and pattern controllers, with steel face.
- D. Finish: Baked enamel, color selected by Architect .

- E. Duct Inlet: Round.
- F. Face Style: Flush.

### **2.3 LOUVER FACE DIFFUSERS**

- 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. Anemostat Products; a Mestek company.
  - 2. METALAIRE, Inc.
  - 3. Price Industries.
  - 4. Titus.
  - 5. Tuttle & Bailey.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following
- C. Devices shall be specifically designed for variable-air-volume flows.
- D. Material: Steel or Aluminum.
- E. Finish: Baked enamel, color selected by Architect.
- F. Mounting: Surface.
- G. Pattern: One-way core style.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas where diffusers are 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 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 practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers 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 to air patterns indicated, or as directed, before starting air balancing.

**END OF SECTION 233713.13**

**SECTION 238123.13 - COMPUTER-ROOM AIR-CONDITIONERS, CEILING-MOUNTED  
UNITS**

**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 ceiling-mounted, computer-room air conditioners.

**1.3 DEFINITIONS**

- A. COP: Coefficient of performance.
- B. EER: Energy efficiency ratio.
- C. SCR: Silicon-controlled rectifier.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include material descriptions, dimensions of individual components and profiles, and finishes for computer-room air-conditioning units.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For computer-room air conditioners.
  - 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.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from installers of the items involved.
- B. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For computer-room air conditioners to include in emergency, operation, and maintenance manuals.

**1.7 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of computer-room air conditioners that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  - 1. Compu-Aire, Inc.
  - 2. Data Aire Inc.
  - 3. Liebert; a brand of Emerson Electric Co.
  - 4. <Mitsubishi Electric>.

**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. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
- D. ASME Compliance: Fabricate and label water-cooled condenser shell to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

### **2.3 MANUFACTURED UNITS**

- A. Description: Self-contained, factory assembled, prewired, and prepiped; consisting of cabinet, fan, filters, and controls.
  1. Mounting Configuration: Fit T-bar in lay-in ceiling opening.
  2. Mounting Configuration: Concealed above a hard ceiling.
- B. Cabinet: Galvanized steel serviceable from one side, with baked-enamel finish, insulated with 1/2-inch- thick duct liner, and mounting bracket attached to the unit.
  1. Integral factory-supplied supply and return grille to fit ceiling grid kit of 24 by 48 inches, with filter.
  2. Unit with supply and return collars for ducting in the field.
  3. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Supply-Air Fan:
  1. Plug/plenum, single inlet, direct drive, electronically commutated, and variable speed.
- D. Refrigeration System:
  1. Compressor: Scroll, with oil strainer, internal motor overload protection, resilient suspension system, and crankcase heater.
  2. Refrigeration Circuit Components:
    - a. Low-pressure switch.
    - b. Manually reset, high-pressure switch.
    - c. Thermal-expansion valve with external equalizer.
    - d. Sight glass with moisture indicator.
    - e. Service shutoff valves.
    - f. Charging valves.
    - g. Refrigerant charge.
  3. Refrigerant: R-410A.

4. Refrigerant Evaporator Coil: Direct-expansion coil of seamless copper tubes expanded into aluminum fins.
  5. Refrigerant line sets precharged of sufficient length to serve the unit from its condensing unit.
  6. Refrigerant line-sweat-adapter kit to permit field brazing of refrigerant lines.
    - a. Mount stainless-steel drain pan complying with ASHRAE 62.1 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir under coil assembly.
  7. Remote, Air-Cooled Refrigerant Condenser: Integral, copper-tube aluminum-fin coil with direct-drive, propeller fan.
  8. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.
- E. Electric-Resistance Reheat Coil:
1. Finned-tube electric elements with contactor.
  2. High-temperature-limit switches.
  3. SCR to proportionally control the reheat elements providing precise temperature control.
- F. Filter: 1-inch- thick, disposable, glass-fiber media.
1. Filter Minimum Efficiency Reporting Value:
    - a. MERV Rating: MERV 13 according to ASHRAE 52.2.
- G. Electrode Steam Humidifier: Self-contained, microprocessor-controlled unit with disposable, polypropylene-plastic cylinders, and having field-adjustable steel electrodes and stainless-steel steam dispersion tube.
1. Control: Fully modulating to provide gradual modulation from zero to 100 percent capacity with field-adjustable maximum capacity; with high-water probe.
  2. Drain Cycle: Field-adjustable drain duration and drain interval.
- H. Disconnect Switch: Non-automatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- I. Control System:
1. Microprocessor remote-mounted panel.
  2. Fan contactor.
  3. Compressor contactor.
  4. Compressor start capacitor.
  5. Control transformer with circuit breaker.
  6. Humidity contactor.
  7. Time-delay relay.
  8. Smoke sensor.

9. Filter clog switch.
10. Alarm contacts.
11. Solid-state, wall-mounted control panel with start-stop switch, adjustable humidity set point, remote temperature sensors remote humidity sensors and adjustable temperature set point.
12. Remote panel to monitor and change temperature and humidity set points and sensitivities of the unit and unit alarms.

J. Fan Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load does not require motor to operate in service factor range above 1.0.
  - b. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

### **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 hydronic piping systems to verify actual locations of piping connections before equipment installation.
- C. Examine walls, floors, and roofs for suitable conditions where computer-room air conditioners will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Layout and install computer-room air conditioners and suspension system coordinated with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Install computer-room air conditioners coordinated with computer-room access flooring Installer.
- C. Install computer-room air conditioners level and plumb, maintaining manufacturer's recommended clearances.



- D. Suspended Computer-Room Air Conditioners: Install using continuous-thread hanger rods and elastomeric hangers of size required to support weight of computer-room air conditioner.
  - 1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC." Fabricate brackets or supports as required.
  - 2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- E. Air-Cooled Refrigerant Condenser Mounting: Install using elastomeric mounts on concrete base. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
  - 1. Minimum Deflection: 1 inch.

### **3.3 CONNECTIONS**

- A. Piping installation requirements are specified in other heating, ventilating, and air-conditioning Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to computer-room air conditioners, allow space for service and maintenance.
- C. Water and Drainage Connections: Comply with applicable requirements in Section 221116 "Domestic Water Piping." Provide adequate connections for water-cooled units, condensate drain, and humidifier flushing system.
- D. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Provide shutoff valves and piping.

### **3.4 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. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  - 2. After installing computer-room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Computer-room air conditioners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

**3.5 ADJUSTING**

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

**END OF SECTION 238123.13**

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**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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## **SECTION 260100 - ELECTRICAL GENERAL REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. Provide all permits, materials, labor, equipment and services and perform all operations in connection with the Electrical Work, Coordinate with General Contractor and the items furnished by others complete and in accordance with the Drawings and Specifications.

#### **1.2 REFERENCES**

- A. The requirements of the publications listed below form a part of this Specification and are applicable to the Work performed under Division 26. The publications are referred to in the text by the designation only. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.

AEIC - Association of Edison Illuminating Companies  
ANSI - American National Standards Institute  
ASME - American Society of Mechanical Engineers  
ASTM - American Society for Testing Materials  
NEMA - National Electrical Manufacturers Association  
NESC - National Electrical Safety Code  
NETA - International Electrical Testing Association  
NECA - National Electrical Contractors Association  
NEC - National Electrical Code  
NFPA - National Fire Protection Association  
OSHA - Occupational Safety and Health Administration Regulations  
REA - Rural Electrification Administration  
UL - Underwriters Laboratories  
IEEE - Institute of Electronics and Electrical Engineers  
IES - Illuminating Engineering Society  
CBM - Certified Ballast Manufacturers  
ICEA - Insulated Cable Engineers Association  
IBC - International Building Code  
NJUCC - New Jersey Uniform Construction Code

#### **1.3 QUALITY ASSURANCE**

- A. All Work shall comply with all Local, State and Federal Codes and the requirements of any other authorities having jurisdiction.
- B. All material and equipment shall be UL listed and shall bear the UL inspection label wherever standards have been established and label service is regularly furnished.

#### **1.4 DEFINITIONS**

- A. "The Contractor" or "Each Contractor" means specifically, the Contractor working under his respective Contract. Unless otherwise noted, "Contractor", in the Division 26 Specification and in the accompanying Electrical Drawings, means the Electrical Contractor.
- B. "Electrical Contractor" means the Contractor doing electrical Work.
- C. "Provide" means to supply, erect, install, and connect up in complete readiness for regular operation, the particular Work referenced.
- D. "Furnish" means to supply and deliver to the job at a location suitable to the Owner.
- E. "Conduit" includes all conduit, fittings, boxes, hangers, and other related accessories necessary for a complete installation.
- F. "Concealed" means hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.
- G. "Exposed" means not "concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless specifically noted otherwise.
- H. "Approved equal" means equipment or material which, in the opinion of the Design Professional, is equal in quality, durability, appearance, strength, design, performance, physical dimensions, and arrangement to the equipment or material specified, and which will function adequately in accordance with the general design.
- I. "Governmental" means all municipal, state and federal governmental agencies.
- J. Where any device or part of equipment is referred to in singular (such as "the fixture"), the reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.
- K. Wherever the words "Plan" or "Plans" are used in this Division, it shall also mean "Drawing" or "Drawings".
- L. Design Professional shall mean the firm of:

Paulus, Sokolowski and Sartor  
3 Mountainview Road  
Warren, New Jersey 07059-00039

## **1.5 LOCAL CONDITIONS**

- A. Visit the site where Work is required, survey the existing conditions, and become familiar with the difficulties which will affect the execution and completion of the Work. Investigate the nature and location of the Work, the general and local conditions, particularly those bearing upon the Work including transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, the physical conditions at the site and the character of equipment and facilities needed prior to and during the prosecution of the Work. This requirement also includes all other matters upon which information is reasonably obtainable and which can in any way affect the Work or the cost thereof under the Contract.
- B. Investigation shall also be made of the character, quality and quantity of materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site. Any failure to become acquainted with all the available information will not be considered as a basis for not successfully fulfilling all terms of the Contract, regardless of the difficulty or cost, without extra compensation.

## **1.6 PERMITS AND INSPECTIONS**

- A. Wherever in these Specifications the name of a official, bureau or department is mentioned, it is intended to mean the official, bureau or department having jurisdiction under the Local, County and State Laws.
- B. Deliver to the Owner's Representative all permits and certificates of approval issued by all agencies having jurisdiction in connection with the Work, before the certificate for the final payment is issued.
- C. No Work shall be covered over until tests have been performed and the authorities having jurisdiction have examined, inspected and approved the tests and the Work. The Contractor shall provide all Controlled Inspections required by the regulations of Town, County, and State. The Controlled Inspections shall be made by an inspector meeting the professional requirements set forth by State and Local Laws and shall be carried out in accordance with applicable Town, County, and State Building Code Sections.

## **1.7 INTENT**

- A. It is the intent that these Specifications and accompanying Drawings to indicate for the Work as Specified, shown and required. Any Work shown on the Drawings and not particularly described in the Specifications, or vice-versa, or any Work or changes which may be evidently necessary to complete the installation shall be included in the Contract. It is the meaning and intent of this Specification that the Contractor provide an electrical installation that is complete in every respect, ready for operation.

## **1.8 DRAWINGS**

- A. The Drawings are generally diagrammatic and are intended to convey the scope of Work and indicate general arrangement of equipment, conduits, panels, fixtures, etc and are not to be considered all inclusive.
- B. The locations of all items shown on the Drawings, or called for in the Specifications, that are not definitely fixed by dimensions are approximate. The exact locations necessary to secure the best conditions and results must be determined at the Project site and shall be approved by the Design Professional before installation. Do not scale Drawings.
- C. Follow the Drawings in laying out the Work and check the Drawings of other trades to verify spaces in which the Work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, the Design Professional shall be notified before proceeding with installation.
- D. Conduits connected to equipment may require different size connections than that indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

## **1.9 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS**

- A. In case of disagreement between Drawings and Specifications, or within either document itself, the matter shall be referred to the Design Professional for decision and/or adjustment.

## **1.10 EQUIPMENT AND MATERIALS**

- A. If material or equipment is installed before the Contractor obtained approvals from the Design Professional, the trade installing same shall be liable for removal and replacement at no extra charge to the Owner if, in the opinion of the Design Professional, the material or equipment does not meet the intent of the Drawings and Specifications.
- B. Wherever a manufacturer of a product is specified, and the term "approved equal" is used, the item must conform in all respects to the specified item. Consideration will not be given to a claim that the substituted item meets the required performance requirements if it is of lesser construction (such as lesser grade lighting fixture housing, etc.). Performance as delineated in Contract Documents, or as a function of the performance characteristics of the unit specifically named, shall be interpreted as minimum performance requirements.
- C. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect.
- D. Material shall be delivered "knocked-down" where it is necessary for entrance into the building or space.



- E. After shop drawings and samples have been approved, no changes will be permitted unless satisfactory evidence is presented and approved by the Design Professional. Evidence must include the fact that the manufacturer cannot make scheduled delivery of approved material, or that material developed has been rejected and the substitution of a suitable material is an urgent necessity, or that other conditions become apparent which indicate the approval of changes to be in the best interest of the Owner.

#### **1.11 MINOR DEVIATIONS**

- A. All locations are approximately correct but are understood to be subject to modifications as may be found necessary or desirable in order to meet structural conditions and the requirements of other equipment installations prior to or at the time of installation.
- B. The Design Professional reserves the right to change the locations of outlets, fixtures, conduits, switches, panels and the like, to accommodate the architectural treatment and any other conditions which may arise during the progress of the Work, without additional compensation to the Contractor for such changes.

#### **1.12 ORGANIZATION OF WORK**

- A. The Work called for under this Contract shall be carried out simultaneously with the Work of other trades in a manner such as not to delay the overall progress of the Work. Examine all of the Drawings and Specifications covering the Work of the other trades and with the Work as a whole to determine the relation and extent of this Work with other trades. Furnish promptly to other trades involved at the Project, all required information and measurements relating to the Work. Cooperate with the other trades in order to secure the harmony necessary in the interest of the Project as a whole.
- B. Confer with the other trades whose Work might conflict with the proper execution of the Drawing and Specification requirements, for the purpose of eliminating any, and all conflicts. Where conflict exists between this Work and the Work of other trades, which cannot be resolved at the job site, except to the detriment of the Work, the Design Professional shall be consulted for instructions before proceeding.
- C. Provide all new materials and workmanship of the best grade and install all apparatus in a practical and first-class manner. All Work shall be complete with nothing omitted in the way of labor and materials and delivered in well-working order in every respect.

#### **1.13 PROTECTION OF WORK AND PROPERTY**

- A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the Owner.
- B. General Safety Restrictions:
  - 1. The operation of the interior fire alarm system, audible and visual signals, and communication systems shall not be interfered with.

2. Nothing shall be done, in any way, to block the streets at or about exits, or the exits themselves.
3. There shall be no unauthorized interference with free and unobstructed use of corridors, stairways and toilets.
4. Whenever Work is carried out during normal working hours, not more than one stairway shall be closed off from free and safe use at any time, and this only after the written permission of the Owner's Representative has been obtained.
5. No part of the building or premises shall be closed to the use of the occupants without obtaining the permission of the Owner's Representative.

C. Precautions Against Fire:

1. Take every precaution in the performance of the Work to prevent fires.
2. Smoking shall not be permitted within the premises at any time.
3. Fire department regulations shall govern the storage and use of flammable materials. Flammable materials and fire-producing equipment shall not be left unattended about the premises in locations accessible to the public.
4. Fire extinguishers and other protective equipment shall be provided as required by regulations.
5. During all interruptions of work, flammable mixtures shall be stored in Fire Department approved enclosures and in Fire Department designated locations. Coordinate Work with the Fire Department.

D. Fire Watch:

1. Contractors using open flame or spark producing tools, blow torches and welding rods shall provide fire guards to maintain a fire watch over the operation of these items at all times when is in use. Provide any additional measures required by the Local Fire Department inspector and the Owner's insurance carrier after Work is underway.

E. Temporary Maintenance of Hazardous Conditions:

1. Upon receipt of official notice to start Work, carefully inspect all existing Work which is required to be repaired, altered or removed. Any such Work which is found to be hazardous, shall be immediately put in a safe condition and so maintained until such time as the permanent Work in connection therewith is completed.
2. Any restrictions regarding sequence of operations and locations of Work do not apply to the elimination of hazardous conditions.

F. Protection of Property:

1. The Contractor shall be responsible for all damage to new and existing Work on the premises due to his operations and shall provide and maintain adequate protection against such damage by his operations.
2. The premises shall not be used as a workshop to the detriment of any portion thereof.
3. Desk, tables, benches and other furniture and equipment shall not be used as workbenches and materials and furniture shall not be piled thereon without proper protection.

4. Provide decking on floors, steps, platforms pavements and roof where subject to damage from heavy traffic.
5. Protect doors and door jambs when conveying rubbish and materials.
6. Provide and maintain barricades to confine dust to Work areas.
7. Provide watertight enclosures over openings at roof and walls for the Work.
8. All damage of adjoining Work due to failure to provide adequate protection shall be made good by the Contractor at his own expense.
9. After completing the Work, each Contractor shall thereafter protect his own Work until accepted, except as otherwise required to be protected or made good by other Contractors hereinbefore specified.

G. Protection of Public:

1. Each Contractor shall be responsible for all injuries to persons due to his operations and shall provide and maintain adequate protection against injury.
2. Provide guards, rails, barricades, fences, platforms, decking, night lighting, etc., as required by Local Building Laws and as further required to provide adequate protection.
3. Provide barricades around work areas as required to prevent unauthorized persons from entering therein.
4. Provide plumbing and/or temporary drainage as required to keep all pits, trenches and other excavations, and the adjoining areas of the premises, dry during the course of the Work. Provide pumping for removal of rain and ground-water, back-up from sewers and drains, return-line flow, etc.

#### **1.14 CUTTING AND PATCHING**

- A. Provide cutting, rough and finished patching for the installation of the Electrical Work.
- B. Provide all labor, materials, etc., necessary to complete all cutting, rough patching, painting and finishing work including but not limited to the following:
  1. Exterior ferrous metals, disturbed by the Work of this Contract including door frames and miscellaneous metals.
  2. Interior ferrous metals disturbed by the Work of this Contract including structural and miscellaneous metals doors and frames, interior partitions, access panels and doors, louvers, miscellaneous metal supports, grilles, registers and diffusers.
  3. Existing surfaces disturbed by the Work of this Contract including walls, ceilings, floors, partitions, frames, trim, etc.
  4. Interior Work of this Contract including plaster, concrete and cement, drywall construction, carpentry and millwork, concrete work, all pavements and all walls and all other items disturbed by the Work of this Contract.
- C. The type of materials to be used and the number of coats to be applied shall match existing. All materials shall match existing. Colors and paint type shall be as selected by the Owner.
- D. Cutting and Drilling:

1. Do not cut existing floor or walls until shop drawings have been approved by the Owner's Representative. All core drilling shall occur outside of the Owner's normal working hours, the cost of which shall be included in the Bid.
  2. Cut and drill existing floors, walls, partitions, ceilings, etc., for the installation of the Work shown, including cutting of holes and other openings. No structural beams or walls shall be cut until approval is given by the Design Professional.
  3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent Work. Cut round holes in concrete slabs, floors and walls for conduit with core drills of required sizes and types. Cut square and rectangular holes by line drilling and using chipping hammers to remove material between drill holes. Large air hammers will not be permitted.
  4. Drilling or cutting of columns, beams, joist, girders, or other structural supporting elements will not be permitted, unless specifically approved in each case.
  5. Cover openings temporarily when not in use and patch as soon as the Work is installed.
- E. Alterations, Patching and Repairs:
1. Cut, remove, alter, relocate, and reinstall existing construction as required for performance of Electrical Work.
  2. Coordinate patching with various trades.
- F. Restore finish work of floors, walls and ceilings remaining in place but damaged or defaced because of demolition of alteration work to condition equal to original condition before the Work under this Contract was started Properly close and patch holes and openings in new and existing floor, wall and ceiling surfaces resulting from the alteration Work. Match adjacent undisturbed surfaces.
- G. Firestop all openings caused by cutting and patching Work and as required by Local and State Codes.

#### **1.15 FIELD MEASUREMENTS**

- A. Perform all field operations required to ensure the Work conforms with grades and elevations required. The Contractor shall take all necessary field measurements as required for fabrication and installation of the Work, assume complete responsibility for the conditions on the job, and be responsible for knowledge of same so that all Work will properly join together.

#### **1.16 DETAIL DRAWINGS**

- A. Provide scaled detail drawings, of portions of the Work when requested and required by the Design Professional. Such drawings shall show the Work and its exact relation to the construction and adjoining Work of all other trades. When necessary to adequately describe the arrangement, sections and elevations shall be made, as well as plans.

**1.17 RECORD DRAWINGS**

- A. During construction, keep an accurate record of all deviations between the Work as shown on the Contract Drawings and that which is actually installed. Prepare these Drawings as the Work proceeds. The Drawings shall be kept current at all times and prints of the Drawings shall be submitted in accordance with Division 1 requirements.
- B. When all revisions are made showing the Work as finally installed, the Contractor shall prepare reproducible vellums. These Drawings shall become property of the Owner.

**1.18 TEMPORARY LIGHT & POWER**

- A. The Electrical Contractor shall provide new temporary electric service for temporary light and power the power tools and lighting, trailers.

**1.19 TESTS, ADJUSTING AND DEMONSTRATION**

- A. General:
  - 1. Test, adjust and demonstrate all the systems and equipment specified. In addition, perform all tests and adjustments required by Local, State and Federal Authorities. Provide all labor, materials, appliances, equipment, instruments, water, electricity and transportation, where specified. The owner shall provide independent testing laboratories to conduct the specified tests.
  - 2. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Design Professional.
- B. Adjusting:
  - 1. Adjust all systems to the satisfaction of the Design Professional, and as hereinafter specified.
  - 2. Assume all responsibilities and costs for temporary furnishing and installation of all instruments and recording devices.
  - 3. All instrumentation shall be calibrated by an approved laboratory not more than one (1) month preceding its use.
  - 4. All systems shall be adjusted and placed in operation by the manufacturer. Readjustments necessary to accomplish the specified results during the first year of operation shall be made during the first year of operation and shall be made without cost to the Owner.
- C. Demonstration:
  - 1. After the adjusting report is approved and the Contractor certifies that all adjustments have been performed, demonstrate to the satisfaction of the Design Professional that the system meets all the Design Criteria and all items hereinbefore listed have been satisfactorily accomplished.

**1.20 ALLOWABLE TOLERANCES**

- A. Equipment shall fit in space allocated.
- B. Clearances around all equipment shall permit removal of switchboards, transformers, fans, motors, and all components and shall provide access to all parts and components.
- C. Clearances must conform to Federal, State, Local and OSHA Requirements.

**1.21 WATERPROOFING**

- A. Where any Work pierces waterproofing, including waterproofed concrete, the method of installation shall be as approved by the Design Professional before the Work is done. The Contractor shall provide all necessary sleeves, caulking, and flashing required to make openings absolutely watertight.

**1.22 MANUFACTURER'S DIRECTIONS**

- A. Except as elsewhere specified, all proprietary and manufactured articles and materials shall be used, connected, cleaned and finished, in accordance with the directions and recommendations of the manufacturers of such articles and materials.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. The installation of all electrical equipment, lighting, conduit and wiring shall conform to the latest edition IBC Code Earthquake Control, Section 1621. Architectural, Mechanical and Electrical component seismic design requirements.

**3.2 ROUGH-IN**

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

**3.3 ELECTRICAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves set in poured-in-place concrete and other structural components.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for the effective flow of Work. Give particular attention to large equipment.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of electrical systems with utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Design Professional.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install access panels or doors where equipment is concealed behind finished surfaces.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Determine and comply with the Owner's safety standards such as confined space entry, hot work permits and all required documentation.

### **3.4 MOTOR AND OTHER WIRING**

- A. All appurtenances required for equipment furnished by other trades including float switches, level sensors, remote control pushbuttons and individual motor starters, will be furnished by various other trades, unless noted herein.
- B. All devices shall be arranged in groups as locations coordinated with the Owner and Design Professional. The equipment shall be neatly wired in conduit and be routed in a wiring trough having hinged or screw-on covers. If screw on covers are used, provide sections which can be easily handled. Submit shop drawings of supports and equipment arrangement for approval, before fabrication and installation.
- C. The Work of this Division shall include all circuiting to all line voltage motors, valves, and control pushbuttons. The Work shall also include all 120 volt circuiting from electrical panels to the control panels and devices provided by the various trades which require 120 volt power. Coordinate the location and quantity of 120 volt power requirements with the various trades and include all costs in the Bid.

- D. All motors will be furnished and set under another Division. Properly phase out all feeders and branch circuits and make such changes and alterations necessary to insure the correct rotation of all motor driven equipment throughout the building.
- E. Obtain all information regarding the type, connections, current characteristics, etc., of all electrical equipment and motors from the various trades. The Work of this Division shall include responsibility for the safe and proper operation of the motorized equipment to the extent that it is affected by this Work. Cooperate with the trades of the other Divisions in making all tests required to assure that such operation is achieved. Any special electrical equipment required for these tests shall be made available as part of the Work of this Division.
- F. Provide all frame supports, backboards and the like for proper mounting of all starting, control and disconnect equipment installed. Provide angle iron frames, racks and backboards of adequate dimensions to permit an orderly arrangement of equipment and conduit connections therein. Submit shop drawings of supports and equipment arrangement for approval, before fabrication and installation.
- G. Contractor shall consult with those furnishing the equipment and shall wire to suit their requirements.

**END OF SECTION**



## **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. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Armored cable, Type AC, rated 600 V or less.
- B. Related Requirements:
  - 1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

#### **1.3 DEFINITIONS**

- A. RoHS: Restriction of Hazardous Substances.
- B. VFC: Variable-frequency controller.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
  - 1. Product Data: For each conductor and cable indicating lead content.
  - 2. Product Data: For solvents and adhesives, indicating VOC content.
  - 3. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.
- C. Product Schedule: Indicate type, use, location, and termination locations.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For manufacturer's authorized service representative.
- B. Field quality-control reports.

## **1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Member company of NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## **PART 2 - PRODUCTS**

### **2.1 COPPER BUILDING WIRE**

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpha Wire Company.
  - 2. American Bare Conductor.
  - 3. Belden Inc.
  - 4. Cerro Wire LLC.
  - 5. Encore Wire Corporation.
  - 6. General Cable Technologies Corporation.
  - 7. Service Wire Co.
  - 8. Southwire Company.
  - 9. WESCO.
  - 10. Approved Equal.
- D. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with for stranded conductors.

F. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2: Comply with UL 44.

**2.2 METAL-CLAD CABLE, TYPE MC**

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Service Wire Co.
7. Southwire Company.
8. WESCO.
9. Approved Equal.

D. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

E. Circuits:

1. Single circuit and multi-circuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

F. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

G. Ground Conductor: Insulated.

H. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

- I. Armor: Steel Aluminum, interlocked.
- J. Jacket: PVC applied over armor.

### **2.3 ARMORED CABLE, TYPE AC**

- A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.
- B. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Alpha Wire Company.
  2. American Bare Conductor.
  3. Belden Inc.
  4. Cerro Wire LLC.
  5. Encore Wire Corporation.
  6. General Cable Technologies Corporation.
  7. Service Wire Co.
  8. Southwire Company.
  9. WESCO.
  10. Approved Equal.
- D. Standards:
  1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. RoHS compliant.
  3. Comply with UL 4.
  4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- E. Circuits:
  1. Single circuit and multi-circuit with color-coded conductors.
  2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- F. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- G. Ground Conductor: Insulated.

- H. Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.
- I. Armor: Steel, interlocked.

## **2.4 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. 3M Electrical Products.
  - 2. AFC Cable Systems; a part of Atkore International.
  - 3. Gardner Bender.
  - 4. Hubbell Power Systems, Inc.
  - 5. Ideal Industries, Inc.
  - 6. ILSCO.
  - 7. NSi Industries LLC.
  - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 9. Service Wire Co.
  - 10. TE Connectivity Ltd.
  - 11. Thomas & Betts Corporation; A Member of the ABB Group.
  - 12. Approved Equal.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. 3M Electrical Products.
  - 2. AFC Cable Systems; a part of Atkore International.
  - 3. Gardner Bender.
  - 4. Hubbell Power Systems, Inc.
  - 5. Ideal Industries, Inc.
  - 6. ILSCO.
  - 7. NSi Industries LLC.
  - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 9. Service Wire Co.
  - 10. TE Connectivity Ltd.
  - 11. Thomas & Betts Corporation; A Member of the ABB Group.
  - 12. Approved Equal.
- D. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- E. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: Two hole with standard barrels.
  - 3. Termination: Compression.

## **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. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
- F. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway Armored cable, Type AC Metal-clad cable, Type MC.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway Armored cable, Type AC Metal-clad cable, Type MC.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway Armored cable, Type AC Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. 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.

- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

### **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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

### **3.5 IDENTIFICATION**

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

### **3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL 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 Electrical Raceways and Cabling."

### **3.7 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**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. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
  - 1. Underground distribution grounding.
  - 2. Ground bonding common with lightning protection system.
  - 3. Foundation steel electrodes.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
  - 1. Product Data: For each conductor and cable indicating lead content.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Ground rings.
  - 4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

## **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For grounding 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. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
      - 1) Test wells.
      - 2) Ground rods.
      - 3) Ground rings.
      - 4) Grounding arrangements and connections for separately derived systems.
    - b. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems Insert locations based on NETA MTS Insert reference.
      - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.

## **1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Certified by NETA.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- 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. Comply with UL 467 for grounding and bonding materials and equipment.

### **2.2 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.

2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.
11. Thomas & Betts Corporation; A Member of the ABB Group.
12. Approved Equal.

### **2.3 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: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  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: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.
- D. Lead Content: Less than 300 parts per million.

### **2.4 CONNECTORS**

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

- D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- H. Conduit Hubs: Mechanical type, terminal with threaded hub.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt socket set screw.
- J. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- K. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- L. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- M. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- N. Straps: Solid copper, copper lugs. Rated for 600 A.
- O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- P. Water Pipe Clamps:
  - 1. Mechanical type, two pieces with zinc-plated bolts.
    - a. Material: Die-cast zinc alloy.
    - b. Listed for direct burial.
  - 2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.
- Q. Lead Content: Less than 300 parts per million.

## **2.5 GROUNDING ELECTRODES**

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

### **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. Underground Grounding Conductors: Install bare tin-plated copper conductor, No. 4/0 AWG minimum.
  - 1. Bury at least 24 inches below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. 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 Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

#### **3.2 GROUNDING AT THE SERVICE**

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

#### **3.3 GROUNDING SEPARATELY DERIVED SYSTEMS**

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

#### **3.4 EQUIPMENT GROUNDING**

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. 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.
  7. Armored and metal-clad cable runs.
- C. 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.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### **3.5 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. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  2. Use exothermic welds or suitable mechanical connections for all below-grade connections.
  3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

- E. 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. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
  
- F. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
  
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
  
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
  - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
  - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
  
- J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.
  
- K. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.

2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

### **3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections:
  1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. 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. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer 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.
  4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- F. Grounding system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Report measured ground resistances that exceed the following values:



1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5ohms.
  3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
  5. Substations and Pad-Mounted Equipment: 5 ohms.
  6. Manhole Grounds: 10 ohms.
- I. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**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.
- B. Related Sections include the following:
  - 1. Section 260548 "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. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

## **1.5 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
  
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.

## **1.6 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. 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 together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Wesanco, Inc.
  - h. Approved Equal.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 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:
  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 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 as required per code.
- 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. 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:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of 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) Approved Equal.
2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  3. 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 Section 055000 "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 scheduled in NECA 1, where it's Table 1 lists maximum spacing less than stated in 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 two-bolt conduit clamps, single-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel as necessary.
- 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 Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  - 5. To Light Steel: Sheet metal screws.
  - 6. 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. Comply with installation requirements in Section 055000 "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 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. Touchup: Comply with requirements in Section 099100 "Painting Standard Line Products" and Section 099600 "High Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

## **SECTION 260533 - RACEWAYS 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. Section Includes:
  - 1. Metal conduits, tubing, and fittings.
  - 2. Nonmetal conduits, tubing, and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Nonmetal wireways and auxiliary gutters.
  - 5. Surface raceways.
  - 6. Boxes, enclosures, and cabinets.
  - 7. Handholes and boxes for exterior underground cabling.
- B. Related Requirements:
  - 1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

#### **1.3 DEFINITIONS**

- A. EMT: Electrical Metallic Tubing.
- B. FMC: Flexible Metal Conduit.
- C. LFMC: Liquidtight Flexible Metal Conduit.
- D. RNC: Rigid Nonmetallic Conduit.
- E. RMC or RGC: Rigid Galvanized Steel Conduit

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. LEED Submittals:



1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Conduit 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 conduit 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 enclosures, cabinets, and conduit 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 the certification is based and their installation requirements.
  4. Detailed description of conduit support devices and interconnections on which the 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 available 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.
  4. Calbond a subsidiary of CalPipe Industries, Inc.
  5. Electri-Flex Company.
  6. O-Z/Gedney; a brand of EGS Electrical Group.
  7. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
  8. Republic Conduit.

9. Robroy Industries.
  10. Southwire Company.
  11. Thomas & Betts Corporation.
  12. Western Tube and Conduit Corporation.
  13. Wheatland Tube Company; a division of John Maneely Company.
  14. Approved Equal.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. 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.
    - b. Type: Setscrew or compression.
  3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions were installed, and including flexible external bonding jumper.
- K. 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 NONMETALLIC CONDUITS, TUBING, AND FITTINGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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.
  3. Arnco Corporation.
  4. CANTEX Inc.
  5. CertainTeed Corp.
  6. Condux International, Inc.
  7. Electri-Flex Company.
  8. Kraloy.
  9. Lamson & Sessions; Carlon Electrical Products.
  10. Niedax-Kleinhuis USA, Inc.
  11. RACO; a Hubbell company.
  12. Thomas & Betts Corporation.
  13. Approved Equal.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### **2.3 METAL WIREWAYS AND AUXILIARY GUTTERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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; a Pentair company.

3. Mono-Systems, Inc.
  4. Square D; a brand of Schneider Electric.
  5. Approved Equal.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for indoors, Type 3R for outdoors 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.
- C. Fittings and Accessories: Include covers, 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 for indoors and Flanged-and-gasketed type for outdoors unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

#### **2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Moulded Products, Inc.
  2. Hoffman; a Pentair company.
  3. Lamson & Sessions; Carlon Electrical Products.
  4. Niedax-Kleinhuis USA, Inc.
  5. Approved Equal.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## **2.5 SURFACE RACEWAYS**

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: 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 available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Mono-Systems, Inc.
    - b. Panduit Corp.
    - c. Wiremold / Legrand.
    - d. Approved Equal.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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. Mono-Systems, Inc.
    - c. Panduit Corp.
    - d. Wiremold / Legrand.

## **2.6 BOXES, ENCLOSURES, AND CABINETS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Adalet.
  - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a Pentair company.
  - 7. Hubbell Incorporated; Killark Division.
  - 8. Kraloy.
  - 9. Milbank Manufacturing Co.
  - 10. Mono-Systems, Inc.
  - 11. O-Z/Gedney; a brand of EGS Electrical Group.

12. RACO; a Hubbell Company.
  13. Robroy Industries.
  14. Spring City Electrical Manufacturing Company.
  15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
  16. Thomas & Betts Corporation.
  17. Wiremold / Legrand.
  18. Approved Equal.
- B. General Requirements for Boxes, Enclosures, and Cabinets: 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, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal or sheet 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. Nonmetallic Floor Boxes:
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep .
- M. Gangable boxes are allowed.
- N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for indoors and Type 3R for outdoors 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: Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:

1. NEMA 250, Type 1 for indoors and Type 3R for outdoors 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.
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.

## **2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**

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.

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 available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Armorcast Products Company.
  - b. Carson Industries LLC.
  - c. NewBasis.
  - d. Oldcastle Precast, Inc.; Christy Concrete Products.
  - e. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
  - f. Quazite, Hubbell.
  - g. Approved Equal.
3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC." .

8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation; Hubbell Power Systems.
    - d. NewBasis.
    - e. Nordic Fiberglass, Inc.
    - f. Oldcastle Precast, Inc.; Christy Concrete Products.
    - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
    - h. Approved Equal.
  3. Standard: Comply with SCTE 77.
  4. Color of Frame and Cover: Gray.
  5. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  6. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  7. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  8. Cover Legend: Molded lettering, "ELECTRIC."
  9. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  10. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## **2.8 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 RACEWAY APPLICATION**

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: RMC or RNC, Type EPC-80-PVC
  2. Concealed Conduit, Aboveground: RMC.
  3. Underground Conduit: RNC, Type EPC-40-PVC Type EPC-80-PVC.
  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 raceway 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: RMC.
  4. Exposed, Manufacturing Area: RMC, PVC Coated Conduit and Fittings.
  5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  7. Damp or Wet Locations: RMC.
  8. 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 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. Comply with NEMA FB 2.10.
  2. EMT: Use setscrew or compression, fittings. Use compression type up to 1-1/4 inch EMT, set screw type 1-1/2 inch EMT and larger. Die cast compression fittings not acceptable. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass-through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.
- H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

### **3.2 INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- 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. 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 four 90-degree bends in any conduit run.
- 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. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Interior concrete slab 6 inches or greater and below slabs on grade: Provide RMC or EMT elbows for stub-ups out of the slab.
- J. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. 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.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- Q. 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. Cap underground raceways designated as spare above grade alongside raceways in use.
- R. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
  - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- S. Install raceway sealing fittings at accessible locations according to NFPA 70 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 according to NFPA 70.
- T. Install devices to seal raceway 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 raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Where otherwise required by NFPA 70.
- U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- V. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for [recessed and semi-recessed luminaires, 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.
- X. 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 top of box unless otherwise indicated.
- Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- AA. Locate boxes so that cover or plate will not span different building finishes.
- BB. 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.
- CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- DD. Set metal floor boxes level and flush with finished floor surface.
- EE. 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 0312000 "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 0312000 "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 length of elbow.
5. 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, 36" below grade.
- 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 ELECTRICAL 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 Electrical Raceways and Cabling."

**3.6 FIRESTOPPING**

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078400 "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.

**END OF SECTION 260533**

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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## **SECTION 260536 - CABLE TRAYS 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. Section Includes:
  - 1. Ladder cable tray.
  - 2. Cable tray accessories.
  - 3. Warning signs.
- B. Related Requirements:
  - 1. Section 270536 "Cable Trays for Communications Systems" for cable trays and accessories serving communications systems.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include data indicating dimensions and finishes for each type of cable tray indicated.
- B. Shop Drawings: For each type of cable tray.
  - 1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
  - 2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
    - a. Vertical and horizontal offsets and transitions.
    - b. Clearances for access above and to sides of cable trays.
    - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
    - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
- C. Delegated-Design Submittal: For seismic restraints.



1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer who is licensed in the state where Project is located and who is responsible for their preparation.
2. Design Calculations: Calculate requirements for selecting seismic restraints.
3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
  2. Vertical and horizontal offsets and transitions.
  3. Clearances for access above and to side of cable trays.
  4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
- B. Seismic Qualification Certificates: For cable trays, 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.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cable tray supports and seismic bracing.
- B. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
  2. See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table for requirements to be inserted in subparagraph below.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

## **2.2 GENERAL REQUIREMENTS FOR CABLE TRAY**

- A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
  - 1. Source Limitations: Obtain cable trays and components from single manufacturer.
- B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.
- C. Structural Performance: See articles on individual cable tray types for specific values for the following parameters:
  - 1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
  - 2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
  - 3. Load and Safety Factors: Applicable to both side rails and rung capacities.

## **2.3 LADDER CABLE TRAY**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB Electrification Products.
  - 2. EATON B-Line.
  - 3. Chalfant Manufacturing Co.
  - 4. Cope
  - 5. MonoSystems, Inc.
  - 6. MP Husky USA Cable Tray & Cable Bus
  - 7. Niedax, Inc.
  - 8. Snake Tray
- B. Description:
  - 1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
  - 2. Width: 18 inches, unless otherwise indicated on Drawings.
  - 3. Minimum Usable Load Depth: 6 inches.
  - 4. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
  - 5. Rung Spacing: 12 inches o.c.

6. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
7. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
8. No portion of the rungs shall protrude below the bottom plane of side rails.
9. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
10. Fitting Minimum Radius: 12 inches.
11. Class Designation: Comply with NEMA VE 1.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
14. Covers: Solid type made of same materials and with same finishes as cable tray.

C. Materials and Finishes:

1. Steel:
  - a. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33
  - b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
  - c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
  - d. Finish: Hot-dipped galvanized after fabrication, complying with ASTM A123/A123 M, Class B2.
    - 1) Hardware: Galvanized, ASTM B 633.
  - e. Finish: Hot-dipped galvanized after fabrication, complying with ASTM A 653/A 653M, G90.
    - 1) Hardware: Galvanized, ASTM B 633.
  - f. Finish: Electrogalvanized after fabrication, complying with ASTM B 633.
    - 1) Hardware: Galvanized, ASTM B 633.
  - g. Finish: Powder-coat enamel paint.
    - 1) Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
    - 2) Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
    - 3) Epoxy-Resin Topcoat: Epoxy, cold-cured gloss, MPI# 77.
    - 4) Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
  - h. Finish: Factory-standard primer, ready for field painting, with stainless steel hardware according to ASTM F 593 and ASTM F 594.
2. Aluminum:

- a. Materials: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32 according to ANSI H35.1/H 35.1M for fabricated parts.
  - b. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
  - c. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
3. Stainless Steel:
- a. Materials: Low-carbon, passivated stainless steel, Type 316L, ASTM F 593 and ASTM F 594.
  - b. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

## **2.4 CABLE TRAY ACCESSORIES**

- A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
- B. Barrier Strips: Same materials and finishes as for cable tray.
- C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

## **2.5 WARNING SIGNS**

- A. Lettering: 1-1/2-inch high, black letters on yellow background, with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."
- B. Comply with Section 260553 "Identification for Electrical Systems."

## **2.6 SOURCE QUALITY CONTROL**

- A. Testing: Test and inspect cable trays according to NEMA FG 1.

## **PART 3 - EXECUTION**

### **3.1 CABLE TRAY INSTALLATION**

- A. Install cable tray and support systems according to NEMA FG 1.
- B. Install cable tray as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

- C. Install cable tray, so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
- D. Remove burrs and sharp edges from cable trays.
- E. Join aluminum cable tray with splice plates; use four square-neck carriage bolts and locknuts.
- F. Fasten cable tray supports to building structure and install seismic restraints.
- G. Design fasteners and supports to carry cable tray, cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems." Comply with seismic-restraint details according to Section 260548.16 "Seismic Controls for Electrical Systems."
- H. Place supports, so that spans do not exceed maximum spans on schedules, and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of tray rungs.
- I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
- J. Support assembly to prevent twisting from eccentric loading.
- K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.
- L. Do not install more than one cable tray splice between supports.
- M. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.
- N. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed recommended dimensions. Space connectors and set gaps according to applicable standard.
- O. Make changes in direction and elevation using manufacturer's recommended fittings.
- P. Make cable tray connections using manufacturer's recommended fittings.
- Q. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."
- R. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- S. Install cable trays with enough workspace to permit access for installing cables.

- T. Install barriers to separate cables of different systems, such as power, communications, and data processing, or of different insulation levels, such as 600, 5000, and 15 000 V.
- U. Install permanent covers and cover clamps, if used, after installing cable.
- V. Clamp covers on cable trays installed outdoors with heavy-duty clamps.
- W. Install warning signs in visible locations on or near cable trays after cable tray installation.

### **3.2 CABLE TRAY GROUNDING**

- A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Cable trays with electrical power conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
- C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals or to each section of tray whichever is shorter. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."
- D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding-bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
- E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

### **3.3 CABLE INSTALLATION**

- A. Install cables only when each cable tray run has been completed and inspected.
- B. Fasten cables on horizontal runs with cable clamps or cable ties. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
- C. Fasten cables on vertical runs to cable trays every 18 inches.
- D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

- E. Tie mineral-insulated cables down every 36 inches where required to provide a two-hour fire rating and every 72 inches elsewhere.
- F. In existing construction, remove inactive or dead cables from cable trays.

### **3.4 CONNECTIONS**

- A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.
- B. Connect raceways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

### **3.5 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
  - 2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
  - 3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
  - 4. Verify that there are no intruding items, such as pipes, hangers, or other equipment, in the cable tray.
  - 5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
  - 6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorqued in suspect areas.
  - 7. Check for improperly sized or installed bonding jumpers.
  - 8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
  - 9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.
- B. Prepare test and inspection reports.

### **3.6 PROTECTION**

- A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

**END OF SECTION 260536**



**SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS 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 DEFINITIONS**

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
  - 1. Two or more ducts installed in parallel, with or without additional casing materials.
  - 2. Multiple duct banks.
- D. GRC: Galvanized rigid (steel) conduit.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

**PART 2 - PRODUCTS**

**2.1 SOURCE QUALITY CONTROL**

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes 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 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 PREPARATION**

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

#### **3.2 UNDERGROUND DUCT APPLICATION**

- A. See Spec 260533 and drawings.

#### **3.3 UNDERGROUND ENCLOSURE APPLICATION**

- A. Handholes and Boxes for 600 V and Less:
  - 1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: structural load rating.
  - 2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: structural load rating.
  - 3. Units Subject to Light-Duty Pedestrian Traffic Only: Structurally tested according to SCTE 77 with 3000-lbf vertical loading.
  - 4. Cover design load shall not exceed the design load of the handhole or box.
- B. Manholes: concrete.
  - 1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.
  - 2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

#### **3.4 EARTHWORK**

- A. Excavation and Backfill: Comply with Section 0312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 0329200 "Lawns and Grasses".
- D. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017310 "Execution."

### **3.5 GROUNDING**

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

### **3.6 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
  - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
  - 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

### **3.7 CLEANING**

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
  - 1. Sweep floor, removing dirt and debris.
  - 2. Remove foreign material.

**END OF SECTION 260543**

**SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS 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 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 078400 "Fire Stopping Systems" 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.
  2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop 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.

## **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 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 Company (The).
    - d. Pipeline Seal and Insulator, Inc.
    - e. Proco Products, Inc.
    - f. Approved Equal.
  - 2. Sealing Elements: EPDM or Nitrile (Buna N 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, Stainless steel of length required to secure pressure plates to sealing elements.

## **2.3 SLEEVE-SEAL FITTINGS**

- A. Description: Manufactured plastic, sleeve-type, water stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water stop collar with center opening to match piping OD.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Pre-Sealed Systems.

## **2.4 GROUT**

- A. Description: Non-Shrink; 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.

## **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 that 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.

### **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 water stop 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 260548 - VIBRATION AND SEISMIC CONTROLS 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. Isolation pads.
  - 2. Spring isolators.
  - 3. Channel support systems.
  - 4. Restraint cables.
  - 5. Hanger rod stiffeners.
  - 6. Anchorage bushings and washers.
- B. Related Sections include the following:
  - 1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

#### **1.3 DEFINITIONS**

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Wind-Restraint Loading:
  - 1. Basic Wind Speed: 120MPH.
  - 2. Risk Category: III.
  - 3. Wind Importance Factor: 1.15
  - 4. Minimum 10 lb/sq. ft. multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the IBC: D.



2. Assigned Seismic Use Group or Building Category as Defined in the IBC: C.
  - a. Component Importance Factor: 1.0.
  - b. Component Response Modification Factor: 1.5 For Fire Alarm Control and Monitoring Panels and Lighting Fixtures
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.241.
4. Design Spectral Response Acceleration at 1.0-Second Period: 0.067

## **1.5 ACTION SUBMITTALS**

### **A. Product Data: For the following:**

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
  - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
  - b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

### **B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details 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. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
  - a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.
2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:
  - 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 the 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.

- c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

## **1.6 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data.
- C. Welding certificates.

## **1.7 QUALITY ASSURANCE**

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- D. Comply with NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 VIBRATION ISOLATORS**

- 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - 1. Ace Mountings Co., Inc.
  - 2. Amber/Booth Company, Inc.

3. Isolation Technology, Inc.
  4. Kinetics Noise Control.
  5. Mason Industries.
  6. Vibration Eliminator Co., Inc.
  7. Vibration Isolation.
  8. Vibration Mountings & Controls, Inc.
  9. Approved Equal.
- D. Pads, if applicable: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
1. Resilient Material: Oil- and water-resistant rubber.
- E. Spring Isolators, if applicable: Freestanding, laterally stable, open-spring isolators.
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
  6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

## **2.2 SEISMIC-RESTRAINT DEVICES**

- 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Amber/Booth Company, Inc.
  2. Cooper B-Line, Inc.; a division of Cooper Industries.
  3. Hilti Inc.
  4. Loos & Co.; Seismic Earthquake Division.
  5. Mason Industries.
  6. TOLCO Incorporated; a brand of NIBCO INC.
  7. Unistrut; Tyco International, Ltd.
  8. Approved Equal.

- D. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
  - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with 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; and rated in tension, compression, and torsion forces.
- F. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- G. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- H. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchors and studs.
- I. 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.
- J. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- K. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- L. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

### **2.3 FACTORY FINISHES**

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
  - 1. Powder coating on springs and housings.

2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 APPLICATIONS**

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners 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 will be adequate to carry present and future static and seismic loads within specified loading limits.

#### **3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION**

- A. Equipment and Hanger 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 agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. 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.
- C. 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.
- D. Drilled-in 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 pre-stressed 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. Wedge Anchors: 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. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### **3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION**

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- 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 post-connection 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 least 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.
  8. Verify snubber minimum clearances.
  9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

**3.6 ADJUSTING**

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust active height of spring isolators.
- C. Adjust restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION 260548**

## **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. Section Includes:
  - 1. Underground-line warning tape.
  - 2. Warning labels and signs.
  - 3. Instruction signs.
  - 4. Equipment identification labels.
  - 5. Miscellaneous identification products.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each electrical identification product indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

#### **1.5 COORDINATION**

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, 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 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. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

### **2.2 UNDERGROUND-LINE WARNING TAPE**

- A. Tape:
  - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
  - 2. Inscriptions for Red-Colored Tapes: **ELECTRIC LINE, HIGH VOLTAGE.**
  - 3. Inscriptions for Orange-Colored Tapes: **TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.**

### **2.3 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. 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."

## **2.4 EQUIPMENT IDENTIFICATION LABELS**

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw or rivet mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

## **2.5 CABLE TIES**

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F ().
  4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F ().
  4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one-piece, self-locking.
1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
  3. UL 94 Flame Rating: 94V-0.
  4. Temperature Range: Minus 50 to plus 284 deg F ().
  5. Color: Black.

## **2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. 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 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 signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

#### **3.2 IDENTIFICATION SCHEDULE**

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.

- 4) Neutral: White
  - 5) Ground: Green
- c. Colors for 480/277V Circuits:
- 1) Phase A: Brown.
  - 2) Phase B: Orange.
  - 3) Phase C: Yellow.
  - 4) Neutral: Grey.
  - 5) Ground: Green
- d. Use conductors with color factory-applied the entire length of the conductor.
- B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- D. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.
- E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
  2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
  2. Identify system voltage with black letters on an orange background.
  3. Apply to exterior of door, cover, or other access.
  4. For 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.
- G. Operating Instruction Signs: 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.
- H. Emergency Operating Instruction Signs: 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.

- I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the 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 two lines of text are required, use labels 2 inches high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line text with 4-inch- high letters on 6-inch-high label.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  2. Equipment to be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchboards.
    - e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - f. Emergency system boxes and enclosures.
    - g. Enclosed switches.
    - h. Enclosed circuit breakers.
    - i. Enclosed controllers.
    - j. Variable-speed controllers.
    - k. Push-button stations.
    - l. Power transfer equipment.
    - m. Contactors.
    - n. Remote-controlled switches, dimmer modules, and control devices.
    - o. Power-generating units.
    - p. Monitoring and control equipment.
    - q. Lighting Control Panel

**END OF SECTION 260553**

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
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## **SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY**

### **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 computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals may be in digital form.
  - 1. Coordination-study input data, including completed computer program input data sheets.
  - 2. Study and Equipment Evaluation Reports.
  - 3. Coordination-Study Report.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For coordination-study specialist.
- B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

#### **1.5 QUALITY ASSURANCE**

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.
- B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 399 for general study procedures.

## **PART 2 - PRODUCTS**

### **2.1 COMPUTER SOFTWARE DEVELOPERS**

- A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:
- B. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  1. CGI CYME.
  2. EDSA Micro Corporation.
  3. ESA Inc.
  4. Operation Technology, Inc.
  5. SKM Systems Analysis, Inc.
  6. Approved Equal.

### **2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS**

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "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. 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.



### **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. 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. Gather and tabulate the following input data to support coordination study:
1. Product Data for overcurrent protective devices specified in other electrical 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. Impedance of utility service entrance.
  3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
    - a. Circuit-breaker and fuse-current ratings and types.
    - b. Relays and associated power and current transformer ratings and ratios.
    - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    - d. Generator kilovolt amperes, size, voltage, and source impedance.
    - e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    - f. Busway ampacity and impedance.
    - g. Motor horsepower and code letter designation according to NEMA MG 1.
  4. Data sheets to supplement electrical distribution system 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 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. Panelboards, switchboards, ampacity, and interrupting rating in amperes rms symmetrical.

### **3.3 FAULT-CURRENT STUDY**

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
  - 1. Switchboard bus.
  - 2. Distribution panelboard.
  - 3. Branch circuit panelboard.
  - 4. Elevator Controller.
  - 5. Other major mechanical equipment.
- B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141, IEEE 241 and IEEE 242.
  - 1. Transformers:
    - a. ANSI C57.12.10.
    - b. ANSI C57.12.22.
    - c. ANSI C57.12.40.
    - d. IEEE C57.12.00.
    - e. IEEE C57.96.
  - 2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
  - 3. Low-Voltage Fuses: IEEE C37.46.
- E. Study Report:
  - 1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

2. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium- and high-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. 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.

### **3.4 COORDINATION STUDY**

- A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
  1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
  2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
  3. Calculate the maximum and minimum ground-fault currents.
- B. Comply with IEEE 141, IEEE 241 and IEEE 242 recommendations for fault currents and time intervals.
- C. 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.
- D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.
- E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves 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.

- F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
    - a. Device tag.
    - b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
    - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
    - d. Fuse-current rating and type.
    - e. Ground-fault relay-pickup and time-delay settings.
  2. Coordination Curves: Prepared to 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:
    - a. Device tag.
    - b. Voltage and current ratio for curves.
    - c. Three-phase and single-phase damage points for each transformer.
    - d. No damage, melting, and clearing curves for fuses.
    - e. Cable damage curves.
    - f. Transformer inrush points.
    - g. Maximum fault-current cutoff point.
- G. Completed data sheets for setting of overcurrent protective devices.
- H. Submit Coordination Study of entire distribution system, prior to equipment fabrication.

**END OF SECTION 260573**

## **SECTION 260574 - 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 available manufacturers offering products that may be incorporated into the Work include, but are not limited to, 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. 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 study 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. 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 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 transformers.
  2. Panelboard and safety switch over 250 V.
  3. Applicable panelboard and safety switch under 250 V.
  4. 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 260573.19**

## **SECTION 260923 - LIGHTING CONTROL 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. Section Includes:
  - 1. Time switches.
  - 2. Photoelectric switches.
  - 3. Indoor occupancy sensors.
  - 4. Dimmer controls.
  - 5. Power packs and relays.
  - 6. Lighting contactors.
- B. Related Requirements:
  - 1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  - 1. Interconnection diagrams showing field-installed wiring.
  - 2. Include diagrams for power, signal, and control wiring.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

## **PART 2 - PRODUCTS**

### **2.1 TIME SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper Industries, Inc.
  - 2. Intermatic, Inc.
  - 3. Invensys Controls.
  - 4. Leviton Mfg. Company Inc.
  - 5. NSi Industries LLC; TORK Products.
  - 6. Tyco Electronics; ALR Brand.
  - 7. Approved Equal.
- C. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Contact Rating: 30A resistive, 120-480V ac. 30A Tungsten, Inductive or 1000VA Pilot Duty each pole, 120-277V.
  - 3. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
  - 4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
  - 5. Astronomic Time: All channels.
  - 6. Automatic daylight savings time changeover.
  - 7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

### **2.2 OUTDOOR PHOTOELECTRIC SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper Industries, Inc.
  - 2. Intermatic, Inc.
  - 3. NSi Industries LLC; TORK Products.
  - 4. Tyco Electronics; ALR Brand.

5. Approved Equal.
- C. Description: Solid state, with SPST dry contacts rated for 1000 VA, to operate connected load, complying with UL 773.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
  3. Time Delay: Thirty-second minimum, to prevent false operation.
  4. Lightning Arrester: Air-gap type.
  5. Mounting: Twist lock complying with NEMA C136.10, with base.

### **2.3 INDOOR OCCUPANCY SENSORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Bryant Electric; a Hubbell company.
  2. Cooper Industries, Inc.
  3. Hubbell Building Automation, Inc.
  4. Leviton Mfg. Company Inc.
  5. NLight; an Acuity Brands.
  6. Lithonia Lighting; Acuity Lighting Group, Inc.
  7. Lutron Electronics Co., Inc.
  8. NSi Industries LLC; TORK Products.
  9. RAB Lighting.
  10. Sensor Switch, Inc.
  11. Square D; a brand of Schneider Electric.
  12. Watt Stopper.
  13. Approved Equal.
- C. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.

4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
  5. Mounting:
    - a. Sensor: Suitable for mounting in any position on a standard outlet box.
    - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
  7. Bypass Switch: Override the "on" function in case of sensor failure.
  8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
  2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s ().
  3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

## **2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Bryant Electric; a Hubbell company.
  2. Cooper Industries, Inc.
  3. Hubbell Building Automation, Inc.
  4. Leviton Mfg. Company Inc.
  5. NLight; an Acuity Brands.
  6. Lithonia Lighting; Acuity Lighting Group, Inc.
  7. Lutron Electronics Co., Inc.
  8. NSi Industries LLC; TORK Products.
  9. RAB Lighting.
  10. Sensor Switch, Inc.



11. Square D; a brand of Schneider Electric.
  12. Watt Stopper.
  13. Approved Equal.
- C. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
  3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- D. Wall-Switch Sensor Tag OC:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
  2. Sensing Technology: Dual technology - PIR and ultrasonic.
  3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
  4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
  5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
  6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
  7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
  8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

## **2.5 LIGHTING CONTACTORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Allen-Bradley/Rockwell Automation.
  2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
  3. Eaton Corporation.
  4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
  5. Square D; a brand of Schneider Electric.
  6. Approved Equal.
- C. Description: Electrically operated and mechanically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
  2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
  3. Enclosure: Comply with NEMA 250.
  4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- D. BAS/BMS Interface: Provide hardware interface to enable the BAS/BMS to monitor and control lighting contactors.
1. Monitoring: On-off status, Control Room.
  2. Control: On-off operation, Control Room. Coordinate BAS/BMS location with Mechanical Contractor.

## **2.6 CONDUCTORS AND CABLES**

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## **PART 3 - EXECUTION**

### **3.1 SENSOR INSTALLATION**

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

### **3.2 CONTACTOR INSTALLATION**

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

### **3.3 WIRING INSTALLATION**

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### **3.4 IDENTIFICATION**

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate lighting control devices and 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. Owner, at it's option is to perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Owner to prepare test and inspection reports.

**3.6 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
  2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
  3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

**3.7 DEMONSTRATION**

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 260943.13 "Addressable-Fixture Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls."
- B. Engage a factory-authorized service representative to Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

**END OF SECTION 260923**

## **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. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 500 kVA:
  - 1. Distribution transformers.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer 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. Wiring Diagrams: Power, signal, and control wiring.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." 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."
    - 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."

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 test 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: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- B. Source Limitations: Obtain each transformer type 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. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

### **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.

### **1.8 COORDINATION**

- A. 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.
- B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

## **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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Products.
  - 2. General Electric Company.
  - 3. Siemens Energy & Automation, Inc.
  - 4. HPS; Hammond Power Solutions.
  - 5. Sola/Hevi Duty.
  - 6. Square D; Schneider Electric.
  - 7. ABB.
  - 8. Approved Equal.

### **2.2 GENERAL TRANSFORMER REQUIREMENTS**

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
  - 1. Internal Coil Connections: Brazed or pressure type.
  - 2. Coil Material: Copper.

### **2.3 DISTRIBUTION TRANSFORMERS**

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Cores: One leg per phase.
- D. Enclosure: Ventilated, NEMA 250, Type 2.
  - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- E. Transformer Enclosure Finish: Comply with NEMA 250.
  - 1. Finish Color: ANSI 61 gray or green.

- F. Taps for Transformers Smaller than 3 kVA: None.
- G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- J. Energy Efficiency for Transformers Rated 15 kVA and Larger:
  - 1. Comply with Department of Energy (DOE) CFR Title 10 Chapter II Part 431 (in Appendix A of Subpart K 2016) DOE 2016 Efficiency Levels.
- K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for non-sinusoidal 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.
- L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize inter-winding 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.
  - 3. Shield Effectiveness:
    - a. Capacitance between Primary and Secondary Windings: Not to exceed 33 pico-farads over a frequency range of 20 Hz to 1 MHz.
    - b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
    - c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.
- M. Wall Brackets: Manufacturer's standard brackets.
- N. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.
- O. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:
  - 1. 9 kVA and less: 37 dBA.
  - 2. 30 to 50 kVA: 42 dBA.
  - 3. 51 to 150 kVA: 47 dBA.



4. 151 to 300 kVA: 52 dBA.
5. 301 to 500 kVA: 57 dBA.

#### **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 C57.12.91.
- 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. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
  1. Brace wall-mounting transformers as specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

- B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

### **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."

### **3.4 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.
- C. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

### **3.5 CLEANING**

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

**END OF SECTION**

## **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 volt and less.
  - 2. Disconnecting and overcurrent protective devices.
  - 3. Instrumentation.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 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 of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. 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.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For switchboards 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. Routine maintenance requirements for switchboards and all installed components.
  2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  3. 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.

### **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2 and trained in electrical safety as required by NFPA 70E.
- 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.

## **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 NEMA PB 2.

## **1.9 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.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit (Basis of Design).
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- B. Front-Connected, Front-Accessible Switchboards:
  - 1. Main Devices: Fixed, individually mounted.
  - 2. Branch Devices: Panel mounted.
  - 3. Sections front and rear aligned.
- C. Nominal System Voltage: 277/480 V.
- D. Main-Bus Continuous: Rating as indicated on drawing Electrical One-line Diagram.

- E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- F. Indoor Enclosures: Steel, NEMA 250, Type 1.
- G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- H. Barriers: Between adjacent switchboard sections.
- I. Insulation and isolation for main and vertical buses of feeder sections.
- J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- K. Customer Metering Compartment: A separate customer metering compartment 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.
- L. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- M. Buses and Connections: Three phase, four wire unless otherwise indicated.
  - 1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, with uniform ampacity for entire length of switchboard.
  - 2. 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.
  - 3. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with compression connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
  - 4. 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.
  - 5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
  - 6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
- N. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

- O. 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.
- P. Short-circuit current rating: Fully rated to interrupt symmetrical short-circuit current available at terminals as indicated on drawing Electrical One-line Diagram. Series connected ratings are not acceptable.

## **2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, 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.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings for circuit breaker frame sizes 250A and larger:
    - 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<sup>2</sup>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 two-pole configurations with Class A ground-fault protection (6-mA trip).
  - 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
  - 7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
    - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

- h. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
- B. Insulated-Case Circuit Breaker (ICCB): 80 percent rated (unless otherwise noted), sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
1. Fixed circuit-breaker mounting.
  2. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
  3. Remote trip indication and control.
  4. Control Voltage: 120V AC.

### **2.3 INSTRUMENTATION**

- A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
1. Potential Transformers: IEEE C57.13; 120 V, 60 Hz, double secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
  2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; wound type; double secondary winding and secondary shorting device. 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. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
    - a. Phase Currents, Each Phase: Plus or minus 1 percent.
    - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
    - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
    - d. Power Factor: Plus or minus 2 percent.
    - e. Frequency: Plus or minus 0.5 percent.
  2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.



**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.
- 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.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION**

- A. Install switchboards and accessories according to NEMA PB 2.
- 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 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.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and 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, transient voltage suppression devices, and instrumentation.
  - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Comply with NECA 1.

### **3.3 CONNECTIONS**

- A. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.
- B. Comply with requirements for terminating cable trays specified in Section 260536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

### **3.4 FIELD QUALITY CONTROL**

- A. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. 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.
  - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Switchboard will be considered defective if it does not pass tests and inspections.
- D. 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.
- E. Perform tests in accordance with NFPA 70E.

**3.5 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."

**END OF SECTION**

## **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.

#### **1.3 DEFINITIONS**

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. 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. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
  - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
  - 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.

### **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 QUALITY ASSURANCE**

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- 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. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

### **1.8 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.

## **1.9 COORDINATION**

- 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. 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.

## **1.10 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression 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 GENERAL REQUIREMENTS FOR PANELBOARDS**

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
  - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover, door-in-door construction type.
  - 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, 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.
6. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Main and Neutral Lugs: Mechanical type.
  3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  5. Sub-feed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
  6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals as indicated on drawing Electrical One-line and Riser Diagram. Series connected ratings are not acceptable.

## **2.2 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 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."

## **2.3 DISTRIBUTION PANELBOARDS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work

include, but are not limited to, the following:

- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings Eaton Electrical Inc.; Cutler-Hammer Business Unit or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- C. Panelboards: NEMA PB 1, power and feeder distribution type.
- D. Doors: Secured with vault-type latch with tumbler lock; keyed alike, door-in-door construction type.
  - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- E. Mains: Lugs only.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

#### **2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker or lugs only.



- E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike, door-in-door construction type.

## **2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 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 250A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and 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<sup>2</sup>t response.
  - 4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  - 5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, 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 250A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and 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<sup>2</sup>t response.
  - 4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  - 5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

- d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- e. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
- f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
- g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
- h. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
- i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install panelboards and accessories according to NEMA PB 1.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.

- G. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with 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. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- 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 distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### **3.4 ADJUSTING**

- A. Adjust moving parts and operable component 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:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes. Record all load readings before and after changes and submit test records.
  - 3. Tolerance: Balance current on each phase conductor within 5% for each panelboard.

### **3.5 Tests and Inspections:**

- 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 3. 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.
- 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Panelboard will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- D. Perform tests in accordance with NFPA 70E.

**END OF SECTION**

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## **SECTION 262713 - ELECTRICITY METERING**

### **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 equipment for electricity metering by utility company.

#### **1.3 DEFINITIONS**

- A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

#### **1.4 QUALITY ASSURANCE**

- 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.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, store, and handle modular meter center according to NECA 400.

#### **1.6 COORDINATION**

- A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
  1. Comply with requirements of utilities providing electrical power services.
  2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

**PART 2 - PRODUCTS**

**2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY**

- A. Meter will be furnished by utility company.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Socket will be furnished by utility company.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

**END OF SECTION**

## **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. Section Includes:
  - 1. Standard-grade receptacles, 125 V, 20A.
  - 2. USB receptacles.
  - 3. GFCI receptacles, 125 V, 20 A.
  - 4. SPD receptacles, 125 V, 20 A.
  - 5. Toggle switches, 120/277 V, 20A.
  - 6. Occupancy sensors.
  - 7. Wall-box dimmers.
  - 8. Wall plates.

#### **1.3 DEFINITIONS**

- A. AFCI: Arc-fault circuit interrupter.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.



## **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL WIRING-DEVICE REQUIREMENTS**

- A. Wiring Devices, Components, and Accessories: Wiring Devices shall be commercial grade. Devices shall be Decorator Series with matching wall plates style for both switches and receptacles. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with requirements in this Section.
- F. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- G. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Essential Electrical System: Red.
  - 3. SPD Devices: Blue.
- H. Wall Plate Color: For plastic covers, match device color.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.2 HEAVY DUTY RECEPTACLES, 125 V, 20A**

A. Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.

2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

### 2.3 USB RECEPTACLES

A. USB Charging Receptacles :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
3. USB Receptacles: Dual and quad, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
4. Standards: Comply with UL 1310 and USB 3.0 devices.

B. Tamper-Resistant Duplex and USB Charging Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
3. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

#### **2.4 GFCI RECEPTACLES, 125 V, 20 A**

##### **A. Duplex GFCI Receptacles, 125 V, 20 A:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

##### **B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Hubbell Incorporated; Wiring Device-Kellems.
  - b. Pass & Seymour/Legrand (Pass & Seymour).
  - c. Approved Equal.

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

## **2.5 TOGGLE SWITCHES, 120/277 V, 20 A**

### **A. Single-Pole Switches, 120/277 V, 20 A:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Standards: Comply with UL 20 and FS W-S-896.

### **B. Three-Way Switches, 120/277 V, 20 A:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Comply with UL 20 and FS W-S-896.

### **C. Four-Way Switches, 120/277 V, 20 A:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).

2. Standards: Comply with UL 20 and FS W-S-896.

D. Key-Operated, Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Factory-supplied key in lieu of switch handle.
3. Standards: Comply with UL 20 and FS W-S-896.

## 2.6 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Hubbell Incorporated; Wiring Device-Kellems.
  - b. Eaton (Arrow Hart).
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
  - e. Approved Equal.
2. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
3. Standards: Comply with UL 20.
4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
5. Adjustable time delay of 15 minutes.
6. Able to be locked to Manual-On mode.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

B. Wall Sensor Light Switch, Passive Infrared:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Hubbell Premise Wiring.
  - b. Cooper Industries.

- c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
    - e. Approved Equal.
  2. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
  3. Standards: Comply with UL 20.
  4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
  5. Adjustable time delay of 15 minutes.
- C. Wall Sensor Light Switch, Ultrasonic:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Eaton (Arrow Hart).
    - c. Leviton Manufacturing Co., Inc.
    - d. Approved Equal.
  2. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
  3. Standards: Comply with UL 20.
  4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
  5. Adjustable time delay of 15 minutes.
  6. Able to be locked to Manual-On mode.
  7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

## **2.7 DIMMERS**

- A. Wall-Box Dimmers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Lutron Electronics Co., Inc.
    - e. Pass & Seymour/Legrand (Pass & Seymour)
    - f. Approved Equal.
  2. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

3. Control: Continuously adjustable slider; with single-pole or three-way switching.
4. Standards: Comply with UL 1472.
5. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  - a. 600 W; dimmers shall require no derating when ganged with other devices.
6. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

## **2.8 WALL PLATES**

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  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 and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  1. Protect installed devices and their boxes. 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 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 right 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 comply with 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. Pig tailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that 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 in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by 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. 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.

F. 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, multi-gang wall plates.

G. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

### **3.2 IDENTIFICATION**

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

- C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

**END OF SECTION 26826**

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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## **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. Section Includes:
1. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches and enclosed controllers.
  2. Spare-fuse cabinets.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  3. Current-limitation curves for fuses with current-limiting characteristics.
  4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
  5. Coordination charts and tables and related data.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

## **1.5 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

## **1.6 QUALITY ASSURANCE**

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- 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 NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

## **1.7 PROJECT CONDITIONS**

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

## **1.8 COORDINATION**

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Bussmann, Inc.
  2. Edison Fuse, Inc.
  3. Ferraz Shawmut, Inc.
  4. Littelfuse, Inc.
  5. Approved Equal.

### **2.2 CARTRIDGE FUSES**

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

### **2.3 SPARE-FUSE CABINET**

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
  2. Finish: Gray, baked enamel.
  3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
  4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 FUSE APPLICATIONS**

- A. Cartridge Fuses:
  - 1. Feeders: Class RK1, time delay.
  - 2. Motor Branch Circuits: Class RK5, time delay.
  - 3. Other Branch Circuits: Class RK5, time delay.
  - 4. Control Circuits: Class CC, 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 complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

**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. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Shunt trip switches.
  - 4. Molded-case circuit breakers (MCCBs).
  - 5. Molded-case switches.
  - 6. Enclosures.

#### **1.3 DEFINITIONS**

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Enclosed switches and circuit breakers 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."

#### **1.5 ACTION 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, accessories, and finishes.



1. Enclosure types and details for types other than NEMA 250, Type 1.
  2. Current and voltage ratings.
  3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  4. Include evidence of NRTL listing for series rating of installed devices.
  5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.

## **1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, 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. Manufacturer's field service report.

## **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers 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 enclosed switches and circuit breakers.
  2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

## **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. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- 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.
- 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 NFPA 70.

#### **1.9 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 and not exceeding 104 deg F.
  2. Altitude: Not exceeding 6600 feet.
- B. 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 Construction Manager no fewer than 7 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 Construction Manager's written permission.
  4. Comply with NFPA 70E.

#### **1.10 COORDINATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## **PART 2 - PRODUCTS**

### **2.1 FUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton Electrical Inc.; Cutler-Hammer Business Unit. or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
- C. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three 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; labeled for copper and aluminum neutral conductors.
  - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
  - 5. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 6. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

### **2.2 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton Electrical Inc.; Cutler-Hammer Business Unit or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.

- C. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three 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; labeled for copper and aluminum neutral conductors.
  - 3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 5. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

### **2.3 SHUNT TRIP SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton Electrical Inc.; Cutler-Hammer Business Unit. or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. Cooper Bussmann, Inc.
  - 3. Ferraz Shawmut, Inc.
  - 4. Littelfuse, Inc.
  - 5. Approved Equal.
- C. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- D. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- F. Accessories:
  - 1. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 2. Form C alarm contacts that change state when switch is tripped.
  - 3. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
  - 4. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

## **2.4 MOLDED-CASE CIRCUIT BREAKERS**

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. **Basis-of-Design Product:** Subject to compliance with requirements, provide Eaton Electrical Inc.; Cutler-Hammer Business Unit. or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- C. **General Requirements:** Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- D. **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.
- E. **Features and Accessories:**
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 5. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

## **2.5 MOLDED-CASE SWITCHES**

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. **Basis-of-Design Product:** Subject to compliance with requirements, provide Eaton Electrical Inc.; Cutler-Hammer Business Unit or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.

- C. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- D. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  - 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.

## **2.6 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen Areas: NEMA 250, Type 4Xstainless steel .
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4 .
  - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

## **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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### **3.4 FIELD QUALITY CONTROL**

- A. 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.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. 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 enclosed switch and circuit breaker. 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 enclosed switch and circuit breaker 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.
  - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### **3.5 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."

**END OF SECTION 262816**



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## **SECTION 263213 - ENGINE 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. Gas engine.
  - 2. Unit-mounted cooling system.
  - 3. Unit-mounted control and monitoring.
  - 4. Performance requirements for sensitive loads.
  - 5. Outdoor enclosure.
- B. Related Sections include the following:
  - 1. Section 263600 "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.
- B. LP: Liquid petroleum.

#### **1.4 ACTION 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.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." 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."
    - 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."
  - 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.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "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.

## **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.
  - 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 100 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 Level 1 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 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.

## **1.8 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 according to requirements indicated:
  - 1. Notify Construction Manager no fewer than **7** days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.
- B. **Environmental Conditions:** Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: 5 to 40 deg C.
  - 2. Relative Humidity: 0 to 95 percent.
  - 3. Altitude: Sea level to 500 feet .

**1.9 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.

**1.10 WARRANTY**

- A. Special Warranty: Manufacturer's standard form 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: 2 years from date of Substantial Completion.

**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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Onan/Cummins Power Generation; Industrial Business Group.
  - 2. Kohler Co.; Generator Division./Cooper Power Systems
  - 3. MTU Onsite Energy
  - 4. Caterpillar; Engine Division.

**2.2 ENGINE-GENERATOR SET**

- A. Factory-assembled and -tested, engine-generator set.
- B. 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.
- C. Capacities and Characteristics:
  - 1. Power Output Ratings: Nominal ratings as indicated.
  - 2. Output Connections: Three-phase, four wire.
  - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

D. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
  - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.50 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
  - a. Provide permanent magnet excitation for power source to voltage regulator.
10. Start Time: Comply with NFPA 110, Type 10, system requirements.

## 2.3 ENGINE

- A. Fuel: Natural gas.
- B. Rated Engine Speed: 1800 rpm.
- C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.
- D. Lubrication System: The following items are mounted on engine or skid:
  1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.

2. 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.
  3. 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.
- E. Engine Fuel System:
1. Dual Natural Gas with LP-Gas Backup (Vapor-Withdrawal) System:
    - a. Carburetor.
    - b. Secondary Gas Regulators: One for each fuel type.
    - c. Fuel-Shutoff Solenoid Valves: One for each fuel source.
    - d. Flexible Fuel Connectors: One for each fuel source.
- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- G. Governor: Adjustable isochronous, with speed sensing.
- H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
  2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
  3. 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.
  4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
  5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
    - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
- I. 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 23 feet from exhaust discharge after installation is complete shall be 71 dBA or less.
- J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

K. Starting System: 12-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Nickel cadmium valve regulated pocket plate (flooded cell) type. Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
  - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
  - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
  - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
  - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
  - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
  - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

## 2.4 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.



- B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
- C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
  - 1. AC voltmeter.
  - 2. AC ammeter.
  - 3. AC frequency meter.
  - 4. DC voltmeter (alternator battery charging).
  - 5. Engine-coolant temperature gage.
  - 6. Engine lubricating-oil pressure gage.
  - 7. Running-time meter.
  - 8. Ammeter-voltmeter, phase-selector switch(es).
  - 9. Generator-voltage adjusting rheostat.
  - 10. Generator overload.
- D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- E. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.
  - 1. Overcrank shutdown.
  - 2. Coolant low-temperature alarm.
  - 3. Control switch not in auto position.
  - 4. Battery-charger malfunction alarm.
  - 5. Battery low-voltage alarm.
- F. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.
  - 1. Engine high-temperature shutdown.
  - 2. Lube-oil, low-pressure shutdown.
  - 3. Overspeed shutdown.
  - 4. Remote emergency-stop shutdown.
  - 5. Engine high-temperature pre-alarm.
  - 6. Lube-oil, low-pressure pre-alarm.
  - 7. Fuel tank, low-fuel level.
  - 8. Low coolant level.
- G. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

- H. Generator set run time: Minimum time-delay of 15 minutes shall be set, to prevent re-transfer back to normal in case of a short-time outage.
- I. Remote Emergency-Stop Switch: Surface; wall mounted; and labeled. Push button shall be protected from accidental operation.

## **2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION**

- A. Generator Circuit Breaker: Molded-case, electronic type; 100 percent rated; complying with NEMA AB 1 and UL 489.
  - 1. Tripping Characteristic: Designed specifically for generator protection.
  - 2. Trip Rating: Matched to generator rating.
  - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and 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<sup>2</sup>t response.
  - 4. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
  - 5. Mounting: Adjacent to or integrated with control and monitoring panel.
- B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

## **2.6 BRANCH OVERCURRENT PROTECTIVE DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
  - 5. Approved Equal.
- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, 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 all circuit-breaker frame sizes.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and 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<sup>2</sup>t response.
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - c. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

## **2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR**

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Drip proof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
  1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- J. Sub-transient Reactance: 12 percent, maximum.

**2.8 OUTDOOR GENERATOR-SET ENCLOSURE**

- A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 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.
- B. Description: Prefabricated or pre-engineered enclosure with the following features:
1. Construction: Heavy gauge reinforced steel, minimum 14 gauge; rust resistant, vandal resistant, weather-protective housing.
  2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
  3. Space Heater: Thermostatically controlled and sized to prevent condensation if applicable.
  4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
  5. Hinged Doors: Stainless steel lift-off door hinges, folding tee handle composite door latch, locking type keyed alike.
  6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
  7. 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.
  8. Muffler Location: Internal to enclosure.
- 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. Interior Lights with Switch: Factory-wired, vaporproof-type fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.
1. AC lighting system and connection point for operation when remote source is available.
- E. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.
- F. MOTORS
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.
  2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

## **2.9 VIBRATION ISOLATION DEVICES**

- A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
  2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of 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.

## **2.10 FINISHES**

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

## **2.11 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 INSTALLATION**

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Install packaged engine generator with restrained spring isolator shaving a minimum deflection of on 4-inch- high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

**3.3 CONNECTIONS**

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Connect cooling-system water piping to engine-generator set and with flexible connectors.
- D. Connect engine exhaust pipe to engine with flexible connector.
- E. Connect fuel piping to engines with a gate valve and union and flexible connector.
  - 1. Natural-gas piping, valves, and specialties for gas and/or propane distribution are specified in plumbing specifications.

- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### **3.4 IDENTIFICATION**

- A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

### **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. 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.
  - 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 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.
- 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. Supply load bank for generator testing.
- G. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- H. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- I. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- J. Remove and replace malfunctioning units and retest as specified above.
- K. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- L. 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.

### **3.6 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Section 017900 "Demonstration and Training."

**END OF SECTION**



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## SECTION 263353 - UNINTERRUPTIBLE POWER SUPPLY SYSTEMS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This specification describes a three-phase continuous duty, on-line, double conversion, three-level converter topology, solid-state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to provide power conditioning, back-up and distribution for critical electrical loads. The UPS system shall consist of, as required by the project, the UPS module, battery cabinet(s), maintenance bypass, and other features as described in this specification.

#### 1.02 UPS SYSTEM DESCRIPTION

- A. UPS System Components: The 250kW UPS system shall consist of the following main components:
1. One integrated system bypass module (ISBM) and one or more internal uninterruptible power modules (UPM's). The ISBM includes a Static Bypass and associated Control and Monitor Panel, and each UPM includes a Rectifier, Inverter, and Battery Charger.
  2. Battery string(s) in matching Battery Cabinets with 45 minutes of runtime at full load.
  3. Non-matching wall mounted or floor standing maintenance bypass cabinets.
- B. UPM Modes of Operation: Each UPM shall operate as an on-line, fully automatic system in the following modes:
1. Standard: Utilizing commercial AC power, the critical load shall be continuously supplied by the Inverter. The Inverter shall power the load while regulating both voltage and frequency. The Rectifier shall derive power from the commercial AC source and shall supply DC power to the Inverter. Simultaneously, the Battery Charger shall charge the battery.
  2. Battery: Upon failure of the commercial AC power, the critical load shall continue to be supplied by the Inverter, which shall obtain power from the batteries or flywheel without any operator intervention. There shall be no interruption to the critical load upon failure or restoration of the commercial AC source.

3. Recharge: Upon restoration of the AC source, the Charger shall recharge the batteries or flywheel and simultaneously the Rectifier shall provide power to the Inverter. This shall be an automatic function and shall cause no interruption to the critical load.
4. Bypass: If the UPM must be taken out of the Online mode for overload, load fault, or internal failures, the static bypass switch shall automatically transfer the critical load to the commercial AC power. Return from Bypass mode to Normal mode of operation shall be automatic. No-break transfer to and from Bypass mode shall be capable of being initiated manually from the front panel.
5. Energy Saver (ESS) Feature: The UPS shall continuously monitor the voltage and frequency of the bypass source. When the source parameters are within acceptable limits, the UPS will utilize a minimal/optimal combination of its internal subsystems to ensure acceptable power is always delivered to the critical load, at a system efficiency of 99% or greater, over the range of 10% to 100% load. The Energy Saver System shall be enabled by the user and shall be adjustable. It shall incorporate a "High Alert Mode" to automatically (without user intervention) provide maximum power conditioning any time bypass source variation levels exceed preset, adjustable limits. When Energy Saver System is utilized, the UPS must attenuate ANSI C62.41-type line transients to within IEC and ITIC limits. The Energy Saver System shall be able to distinguish between upstream (utility) faults and downstream (load) faults and react appropriately to protect and support the critical load, without interruption.

### **1.03 REFERENCES**

- A. UL 1778 (Underwriters Laboratories) – Standard for Uninterruptible Power Supply Equipment. Product safety requirements for the United States.
- B. CSA C22.2 No 107.1(Canadian Standards Association) – Commercial and Industrial Power Supplies. Product safety requirements for Canada.
- C. NEMA PE-1 – (National Electrical Manufacturers Association) – Uninterruptible Power Systems standard.
- D. IEC 62040-1 (International Electrotechnical Commission) – Uninterruptible power systems (UPS) – Part 1-1: General and safety requirements for UPS used in operator access areas.
- E. IEC 62040-2 (International Electrotechnical Commission) – Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements.
- F. IEC 62040-3 (International Electrotechnical Commission) – Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements.
- G. IEEE 587 (ANSI C62.41) Category A & B (International Electrical and Electronics Engineers) – Recommended practices on surge voltages in low voltage power circuits.

#### **1.04 SUBMITTALS**

- A. The UPS shall be supplied with sufficient documentation, including the following manuals:
  - 1. Installation and Operation Manual: One copy of the installation and operation manual shall be furnished. It shall possess sufficient detail and clarity to enable the owner's technicians or representatives to install and operate the UPS equipment and accessories. The manual shall include the following major items:
    - a) UPS description
    - b) UPS site planning and unpacking
    - c) UPS installation
    - d) Optional accessory installation
    - e) UPS theory of operation
    - f) Operating procedures
    - g) System events
    - h) UPS maintenance
    - i) Performance and technical specifications
    - j) Wiring requirements and recommendations
    - k) Physical features and requirements
    - l) Cabinet dimensions

#### **1.05 QUALIFICATIONS**

- A. The UPS manufacturer shall have a minimum of ten (10) years' experience, in the design, manufacturer and testing of solid-state UPS systems.
- B. The UPS manufacturer shall have ISO 9001 certification for engineering/R&D, manufacturing facilities and service organization.
- C. The UPS manufacturer shall maintain a staffed 7x24x365 call center for technical and emergency support.
- D. Field Engineering Support: The UPS manufacturer shall directly employ a nationwide field service department staffed by factory-trained field service engineers dedicated to startup, maintenance, and repair of UPS equipment. The organization shall consist of local offices managed from a central location. Field engineers shall be deployed in key population areas to provide on-site emergency

response within 24 hours. A map of the United States showing the location of all field service offices must be submitted with the proposal. Third-party maintenance will not be accepted.

- E. Spare Parts Support: Parts supplies shall be located in the field to provide 80% of all emergency needs. Parts are stocked in regional logistics centers, ensuring a 95% First Time Fix rate and maximizing system availability.
- F. Product Enhancement Program: The UPS manufacturer shall make available feature upgrade service offerings to all users as they are developed. These upgrades shall be available as optional field-installable kits.
- G. Maintenance Contracts: A complete range of preventative and corrective maintenance contracts shall be provided and offered with the proposal. Under these contracts, the manufacturer shall maintain the user's equipment to the latest factory revisions.

## 1.06 WARRANTY

All components of the UPS system shall be covered by a standard one-year limited factory warranty and service protection package.

One-year limited factory warranty shall include replacement coverage for the UPS parts for a period of 18 months from shipment or 12 months from start-up, whichever occurs sooner.

One-year service protection package shall include 7x24 on-site repair/replacement labor for UPS parts and batteries; 7x24 technical support coverage; and 7x24 remote monitoring service (with monthly reports for UPS and battery performance). Standard response time shall be 8 hours from receipt of call. Manufacturer shall also offer, as an option, 7x24 on-site service support with guaranteed response times of 4, or 2 hours in certain major metropolitan areas. Additional preventive maintenance visits shall be available as an option for both UPS and battery components.

Manufacturer shall also include Start-up services consisting of: **7x24** Start-up service of UPS and batteries. On-site user training, Site Audit, installation and commissioning of monitoring service, and validation of one-year limited factory warranty will be performed during the start-up.

Manufacturer shall also offer an optional service plan to provide 7x24 on-site coverage (preventive and corrective) for UPS and batteries, guaranteed response time, remote monitoring, Web access to service site history, annual Site Audit, UPS and battery preventive maintenance visit, and discounts on upgrade and modification kits. Manufacturer shall also provide an optional battery service plan to provide parts-and-labor coverage for partial and full battery strings, either with preventive maintenance or replacement coverage.

## **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. The UPS shall withstand any combination of the following external environmental conditions without operational degradation.
1. Operating Temperature for the UPS, excluding batteries: +5 degrees C to +40 degrees C (41 degrees F to 104 degrees F) for UPM loads up to 275 kW and 35 degrees C (95 degrees F) for UPM loads greater than 275 kW.
  2. Storage Temperature: - 25 degrees C to + 60 degrees C (-13 degrees F to 140 degrees F). Prolonged storage above + 40 degrees C (104 degrees F) will cause rapid battery self-discharge.
  3. Relative Humidity (operating and storage): 5 to 95% maximum non-condensing.
  4. There shall be at least a 1.8°F (1.0°C) difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment
  5. The maximum rate of temperature change shall be limited to 3°F over 5 minutes (36°F/hour), based on the ASHRAE standard 90.1-2013
  6. Elevation:
    - (1) Operational: 1000 meters above sea level at 40 C maximum without de-rating. Above that level, altitude de-rating as per EN62040-3
    - (2) Transportation: Capable of air transport

## **1.07 SAFETY**

- A. The UPS shall be certified by a US recognized NRTL (National Recognized Test Laboratory) in accordance with UL 1778.
- B. The UPS shall be certified by a Canadian Recognized Test Laboratory in accordance with CSA C22.2 No.107.3-05.
- C. The UPS shall comply with IEC 62040-1
- D. The cabinets shall be NEMA 1 and IP20 rated.

## **1.08 DELIVERY, STORAGE AND HANDLING**

- A. Deliver equipment in fully enclosed vehicles after specified environmental conditions have been permanently established in spaces where equipment is to be placed.

- B. Store equipment in spaces with environments that are controlled within manufacturer's ambient temperature and humidity tolerances for non-operating equipment.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Eaton 9395P Series (Basis of Design)
  2. Liebert.
  3. MGE.
  4. Approved Equal.

### **2.02 UPS STANDARD FEATURES**

The UPS shall consist of the following standard components and features:

- A. One UPM's consisting of:
1. Rectifier/Charger: Each rectifier/charger shall convert incoming AC power to regulated DC output for supplying the inverter and for charging the battery. The rectifier/charger shall be a high-frequency three-level converter design, using Insulated Gate Bi-polar Transistors (IGBTs). The modular design of the UPS shall permit safe and fast removal and replacement of the rectifier/charger module. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode. The rectifier/charger module shall also provide the following:
    - a) The rectifier shall be capable of drawing power from the utility with a power factor of 0.99 under nominal conditions.
    - b) The rectifier shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.
    - c) The rectifier to be capable of operating from a high impedance grounded transformer.
  2. Inverter: Each inverter shall feature an IGBT three-level pulse-width-modulation (PWM) design with high speed switching. The inverter shall also have the following features:

- a) The inverter shall be capable of providing the specified quality output power while operating from any DC source voltage (rectifier or battery) within the specified DC operating range.
  - b) The modular design of the UPS shall permit safe and fast removal and replacement of the inverter module. Mean time to repair (MTTR) for the module shall be no more than 30 minutes in order to return UPS to normal mode.
  - c) The inverter shall feature protection circuitry that prevents the IGBTs from sourcing current in excess of their published ratings.
- B. ISBM section with Static Bypass: The bypass shall serve as an alternative source of power for the critical load when an abnormal condition prevents operation in normal mode. The bypass shall consist of a fully rated, continuous duty, naturally commutated static switch for high-speed transfers. The bypass shall feature the following transfer and operational characteristics.
1. Transfers to bypass shall be automatically initiated for the following conditions:
    - a) Output overload period expired.
    - b) Critical bus voltage out of limits.
    - c) Internal over temperature period expired.
    - d) Total battery discharge.
    - e) UPS failure.
  2. Uninterrupted automatic re-transfer shall take place whenever the inverter is capable of assuming the critical load.
  3. Uninterrupted automatic re-transfers shall be inhibited for the following conditions:
    - a) When transfer to bypass is activated manually or remotely.
    - b) In the event of multiple transfers/re-transfer operations the control circuitry shall limit "cycling" to three (3) operations in any ten-minute period. The fourth transfer shall lock the critical load on the bypass source.
    - c) UPS failure.
  4. Uninterrupted manual transfers shall be initiated from the control panel. Uninterrupted manual transfers to bypass and from bypass shall be possible with the inverter logic. During manual transfers to bypass mode, the inverter must verify proper bypass operations before transferring the critical load to the bypass.



5. All transfers to bypass shall be inhibited for the following conditions:
    - a) Bypass voltage out of limits (+/- 10% of nominal)
    - b) Bypass frequency out of limits (+/- 3 Hz, adjustable, factory set)
    - c) Bypass out of synchronization
    - d) Bypass phase rotation / installation error
  6. Static transfer time: No break, complete in less than 4ms.
  7. The bypass shall be manually energized using the control panel or remotely through a building alarm input.
- C. Monitoring and control components: The following components shall provide monitor and control capability:
1. Control panel with status indicators.
  2. Alarm and metering display.
  3. Building alarm monitoring.
  4. Communication ports.
- D. Battery management system: The UPS shall contain a battery management system which has the following features:
1. The battery management system shall provide battery time remaining while operating in normal mode and battery mode. Battery time available information shall be displayed real-time, even under changing load conditions. Upon commissioning, battery runtime information shall be available.
  2. The battery management system shall automatically test the battery string(s) to ensure that the battery is capable of providing greater than 80% of its rated capacity. Testing the batteries shall not jeopardize the operation of the critical load. Upon detection of the battery string(s) not capable of providing 80%, the UPS system will alarm that the battery needs attention/replacement. The battery test shall be able to detect the following:
    - Open battery string
    - Shorted battery string
    - Battery capacity (runtime) less than 80% of “new” battery capacity
  3. The UPS shall communicate battery test and monitoring data to the UPS manufacturer’s remote monitoring site. Battery life remaining, capacity, and number of on-battery events shall be provided in a monthly report.

- E. Wiring Terminals: The UPS module shall contain mechanical compression terminals (adequately sized to accommodate 90°C wiring) for securing user wiring to the following locations:
  - 1. Rectifier/charger input connections (3-wire plus ground)
  - 2. Bypass input connections 3-wire plus ground
  - 3. DC link connections for battery cabinets (positive and negative) Separate batteries per UPM, or common batteries across all UPMs can be connected.
  - 4. AC output connections (3 wires plus ground).
  
- F. UPS System Configuration Features
  - 1. The UPS shall utilize a communications network to provide system information and status, such as operating mode and meter data. This network shall provide individual internal UPM information as well as total UPS information and shall be available from the UPS front panel display. The loss of this system information network shall not cause the UPS to transfer to bypass or drop the critical load.
  - 2. UPS's with more than one internal UPM shall have the option to be inherently redundant when the load is less than 50% of the UPS rated capacity. Under load conditions less than 50% of rated UPS capacity, at least one internal UPM shall be redundant.

### **2.03 UPS SYSTEM OPTIONS AND ACCESSORIES**

The UPS system shall consist of the following options and accessories as required:

- A. Field upgrades: Manufacturer shall offer the ability to upgrade the redundancy of the UPS system in the field. Manufacturer shall offer integrated UPM's that can be added in the field, to add redundancy of the UPS. UPS design shall allow at least one integrated UPM to be added in the field.
  
- B. SNMP Network Adapter and UPS Power Monitoring Software: SNMP adapters shall provide a communications interface between the UPS module and SNMP-compatible network management systems. This capability shall allow the unit to be monitored remotely over an Ethernet network using a standard web browser.
  - 1. UPS Power Monitoring Software: This system shall continuously monitor critical power elements associated with the UPS, using the communications port on each module and a customer furnished PC. The system shall automatically alarm if any problems arise and notify local or remote personnel of the alarm condition via email, page, or text message.

- C. Battery Cabinet: The battery cabinet shall feature valve regulated, high-rate discharge, lead-acid batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The batteries shall be flame retardant in accordance with UL 94V2 requirements as a minimum. The battery cabinet shall have the following features:
1. The battery cabinet shall be the same depth and height as the UPS module.
  2. The battery cabinet shall feature a mechanical enclosure of like appearance to the UPS module and shall feature casters. Each battery cabinet shall require front access only for installation, service and maintenance. The battery cabinet shall provide top and bottom cable entry.
  3. Power wiring internal to each battery cabinet shall be factory provided. Each battery cabinet shall feature up to 10 battery trays which can be individually disconnected from the battery cabinet power wiring with quick disconnect devices. Each battery tray shall be firmly secured to the battery cabinet frame with fasteners. Each battery tray shall be removable from the front of the battery cabinet.
  4. Each battery cabinet shall feature a DC rated circuit breaker. The circuit breaker within the battery cabinet shall only provide protection to the battery string within that battery cabinet. For battery configurations involving multiple battery cabinets, a battery string in one battery cabinet may be isolated from the DC link via its circuit breaker without removing other battery strings from the DC link and the UPS module.
  5. The circuit breaker in each battery cabinet shall feature an A/B auxiliary switch. The UPS module shall be capable of monitoring and alarming an open battery cabinet circuit breaker condition.
  6. The circuit breaker in each battery cabinet shall feature a 48VDC shunt trip device. The ST device shall operate to trip the battery breaker(s) for an optional load off command, emergency power off command, or battery disable command.
  7. The batteries shall be configured with one or more ¼” spade type connector(s) for attaching sense leads to each jar to facilitate the future addition of a battery monitoring system.
  8. Expected battery life: 200 complete full load discharge cycles when operated and maintained within specifications.

## **2.04 SURGE SUPPRESSION**

- A. Protect internal UPS components from surges that enter at each ac power input connection including main disconnect switch, static bypass transfer switch, and maintenance bypass/isolation switch. Protect rectifier-charger, inverter, controls, and output components.
- B. Use factory-installed surge suppressors tested according to IEEE C62.41.1 and IEEE C62.41.2, Category B.
- C. Additional Surge Protection: Protect internal UPS components from low-frequency, high-energy voltage surges described in IEEE C62.41.1 and IEEE C62.41.2. Design the circuits connecting with external power sources and select circuit elements, conductors, conventional surge suppressors, and rectifier components and controls so input assemblies will have adequate mechanical strength and thermal and current-carrying capacity to withstand stresses imposed by 400-Hz, 180 percent voltage surges described in IEEE C62.41.1 and IEEE C62.41.2.

## **2.05 UPS RATINGS AND OPERATING CHARACTERISTICS**

- A. UPS Continuous Ratings. The UPS shall be rated for 250kW  
UPS Rating (max) is the maximum output possible from the UPS (for a load power factor range of 0.7 lagging to 0.9 leading). The UPS shall not require de-rating when supporting a leading power factor load of 0.9 or greater. The UPS may be ordered with the optional rating (where available) and later upgraded to its corresponding full UPS Rating (max).
- B. Rectifier/charger input:
  - 1. Nominal three phase input voltage: 480 VAC:  
3-wire plus ground input (grounded wye source or high resistance ground source, required)  
Separate inputs for each UPM are optional
  - 2. Operating input voltage range: + 10%, - 15% of average nominal input voltage without battery discharge. Voltage tolerance, partial load: -30% of nominal voltage without discharging the battery at loads less than 85%.
  - 3. Operating input frequency range shall be 45 to 65Hz.
  - 4. Input power factor 0.99 lagging, for typical load.
  - 5. Normal input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode:

- a) Rectifier input current limit shall be adjustable from 100 to 115% of full-load input current.
  - b) Battery charger current limit shall be adjustable from 0 to 120 amps DC per UPM. With decreased load, maximum charge current per UPM is 120A. Charge capability drops to zero with input line at minus 15% of nominal voltage at full load
6. On-generator input current limit: The UPS shall have the following programmable input current limit settings while operating in normal mode on generator:
- a) Rectifier input current limit shall be adjustable from 100% to 115% of full-load input current.
  - b) Battery charger current limit shall be adjustable from 0 to 120 amps DC per UPM. With decreased load, maximum charge current per UPM is 120A. Charge capability drops to zero with input line at minus 15% of nominal voltage at full load
7. Input current total harmonic distortion (THD) shall be less than 3%.
8. Power walk-in: Ramp-up to full utility load adjustable from 3 seconds to 60 seconds.
9. A 100 kAIC input breaker rating shall be available. UPS is 100kAIC with or without input breaker.
- C. Bypass input:
1. Synchronizing bypass voltage range shall be +/- 10% of average nominal input voltage.
  2. Synchronizing bypass frequency range is centered on the nominal frequency.
  3. Bypass and rectifier inputs can be supplied from out of phase sources if required.
  4. Input surge withstand capability: The UPS shall be in compliance with IEEE 587 (ANSI C62.41), category A & B (6kV).
- D. Rectifier/charger output:
1. Nominal DC voltage shall be 480VDC.
  2. Steady state voltage regulation shall be +/- 1%.
  3. Voltage ripple shall be less than 0.5% (peak-to-peak).
  4. Capacity: The rectifier/charger shall support a fully loaded inverter and recharge the battery to 90% of its full capacity within 10 times the discharge when input current limit is set at maximum.

5. Low line operation: The rectifier/charger shall be capable of sharing the DC load with the battery when the input voltage falls below the specified operation input voltage range, the on-battery indicator shall enunciate operation in this mode.
  6. DC sensing: Redundant DC voltage sensing methods shall be incorporated for providing battery over-voltage protection.
  7. Battery charger characteristics: The UPS battery charging system shall have the following characteristics:
    - a) The charger shall be capable of being configured for several charge modes including:
      - (1) A charging mode that increases battery life by allowing the battery to rest, reducing positive plate corrosion
      - (2) A charging mode floating the battery at a set level, which can be adjusted via software, used for flooded cell applications.
        - (a) Nominal Float Voltage: 2.27 V per cell.
        - (b) Equalizing Voltage: 2.31 V maximum per cell (adjustable).
        - (c) Automatic (time based) or manual (user initiated) equalization available.
    - b) UPM will automatically adjust battery shutdown based upon loading and battery capacity.
      - (1) The UPM shall automatically adjust the final discharge voltage between 1.67 and 1.75 Volts per cell based on the existing load and the rate and length of discharge.
      - (2) The absolute minimum operational voltage is 1.56 V per cell (adjustable).
  8. The UPM will automatically disconnect the battery system via contactor in case of full battery discharge followed by prolonged utility AC voltage failure. The time window before battery disconnection occurs shall be programmable for both time and voltage.
- E. UPS output in standard double conversion mode
1. 480V, 3-phase, 3-wire plus ground.
  2. Steady-state voltage regulation (in inverter) shall be within +/- 1% average from nominal output voltage.
  3. Transient voltage response shall be compliant with Class 1 limits defined in IEC 62040-3 for 20% to 100% load step.

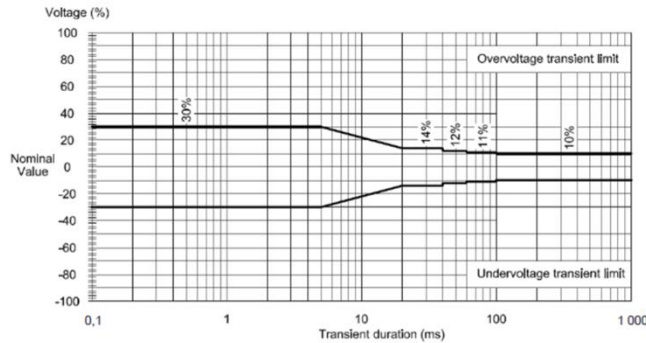


Figure 2 - Curve 1 - Dynamic output performance classification 1

4. Linear load harmonic distortion capability: Output voltage THD of less than 1% for 100% linear load.
5. Non-linear load harmonic distortion capability: Output voltage THD of less than 5% for 100% non-linear load when tested using the non-linear load described in IEC 62040-3.
6. Manual output voltage adjustment shall be +/- 3% from nominal.
7. Line synchronization range shall be +/- 3Hz, adjustable to +/- 5Hz.
8. Frequency regulation shall be +/- 0.1Hz free running.
9. Frequency slew rate shall be adjustable up to 0.7 Hz/second maximum.
10. Phase angle control:
  - a) Balanced linear load shall be +/- 1 degree from nominal 120 degrees.
  - b) Unbalanced linear loads shall less than +/- 3 degrees from average phase voltage for 100% load unbalance.
11. Phase voltage control:
  - a) Balanced linear loads shall be +/- 1% from average phase voltage
  - b) Unbalanced linear loads shall be less than +/- 5% for 100% load unbalanced.
12. Overload current capability (with nominal line and fully charged battery): The unit shall operate with up to 110% of resistive/inductive load for 10 minutes, up to 125% for two minutes, and up to 150% for 10 seconds.
13. Fault clearing current capability: 1000% RMS for 20ms. 600% for 50 ms. With bypass intervention. Inverter alone (no bypass), shall produce 660A RMS per UPM for 10 cycles.
14. Static transfer time: No break, completed in less than 4ms.

15. Acoustical noise: Noise generated by the UPS under normal operation shall not exceed 75dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and <60% load, per ISO7779 standard.
  16. EMC Suppression: The UPS shall meet IEC 62040-2, Category 3.
  17. Electrostatic discharge (ESD): The UPS shall meet EN61000-4-2 level 3.
  18. Efficiency: The UPS incorporates a three-level power converter design for the highest possible efficiency. Efficiency shall be up to 97%, with 25 percent load efficiency not less than 96.1%, with 50 percent load efficiency not less than 96.9%, 75 percent load efficiency not less than 96.5%, and 100 percent load efficiency not less than 96.4%. In VMMS mode the UPS shall operate at no less than 96% efficiency at loads down to 15% of UPS capacity. If UPS requires input filters for controlling input THD, manufacturer shall state efficiency of UPS with input filters connected.
- F. UPS output with Energy Saver System
1. The Energy Saver System acts to optimize the internal components of the UPS power train to maximize system efficiency when the bypass source is within the following (adjustable) limits: Voltage: +/-10%, and Frequency: +/-3Hz.
  2. 480V, 3-phase, 3-wire plus ground.
  3. Steady-state voltage regulation (in inverter) shall be within +/- 10% from nominal output voltage.
  4. Line synchronization range shall be +/- 3Hz, adjustable to +/- 5Hz.
  5. Frequency regulation shall be +/-3Hz when bypass source is within limits in (1) above.
  6. Overload current capability (with bypass source within the limits of (1) above) 1000% for 20msec, 600% for 50 ms
  7. Static transfer time: for input outage: No break, completed in less than 2ms.
  8. Acoustical noise: Noise generated by the UPS under normal operation shall not exceed 75dbA at one meter from any operator surface, measured at 25 degrees C (77 degrees F) and full load.
  9. EMC Suppression: The UPS shall meet IEC 62040-2, Category C3.
  10. Electrostatic discharge (ESD): The UPS shall meet EN61000-4-2 level 3.
  11. Efficiency: The UPS efficiency shall be up to 99%. over the range of 10 to 100% load. If UPS requires input filters for controlling input THD, manufacturer shall state efficiency of UPS with input filters connected.



## **2.06 MECHANICAL DESIGN**

- A. Ventilation: The UPS shall be designed for forced-air cooling. Air inlets shall be on the front of the unit. Air outlets shall be on the top. Eighteen inches of clearance over the UPS outlets shall be required for proper air circulation.
- B. No back or side clearance or access shall be required for the system. The back and side enclosure covers shall be capable of being located directly adjacent to a wall.
- C. Cable entry: Standard cable entry for the UPS cabinet shall be through either the enclosure bottom or top. A dedicated wireway shall be provided within the UPS cabinet for routing user input and output wiring.
- D. Front access: All serviceable subassemblies shall be modular and capable of being replaced from the front of the UPS (front access only required). Side or rear access for installation, service, repair or maintenance of the UPS system shall not be required.
- E. Service area requirements: The system shall require no more than forty-two (42) inches of front service access room and shall not require side or rear access for service or installation.
- F. Shipping Shock and Vibration: Per ASTM D4169
- G. Seismic Standards: UPS modules shall be designed to meet International Building Code 2018, New Jersey and OSHPD seismic requirements, when Eaton seismic bracing kits are installed.
- H. Dimensions: All modules that comprise the UPS will be 34.3 in. (871mm) depth and 73.3 in. (1872mm) height. Width will vary as necessary to fit the parts and options and to facilitate ease of installation. Width of 250 kW frame sections will be 53 in. (1346 mm).

## **2.07 CONTROLS AND INDICATORS**

- A. Microprocessor controlled circuitry: The UPS controls shall have the following design and operating characteristics:
  - 1. Fully automatic operation of the UPS shall be provided through the use of microprocessor controlled Digital Signal Processing. DSP shall eliminate variances from component tolerance or drift and provide consistent operational responses.
  - 2. All operating and protection parameters shall be firmware controlled, thus eliminating a need for manual adjustments. The logic shall include system test capability to facilitate maintenance and troubleshooting. Printed circuit board replacement shall be possible without requiring calibration.
  - 3. Start-up and transfers shall be automatic functions.

- B. **Digital Front Panel Display:** The UPS control panel shall be a digital front panel display that features a 7" Color Touchscreen LCD. The LCD shall display UPS status, metering, battery status, alarm/event queue, and active alarms. The front panel display shall show a system mimic diagram with an outlined power path, current operating mode and event logs, as well as statistics and load profiling.
- C. **Control Panel Information:** The UPS control panel shall provide the following menus and functions from the front panel touchscreen LCD:
1. **HOME:** Displays the power map of the UPS with colors indicating the power flow (online or bypass mode). Also displays data pertaining to system load and efficiency.
  2. **METERS:** Displays performance meters for the system or critical load. When selected, the front display shall show individual screens of input parameters, output parameters or bypass parameters including; voltage, current and frequency in a graphical format. In addition, the battery display shall show runtime remaining. In a parallel system, meters for the local UPS and the other UPS in the system can be viewed.
  3. **CONTROLS:** Allows selection of operating mode, normal, bypass, charger on/off and Power Module on/off. Individual UPMs can also be controlled through this screen. The EAA controls screen can be used to enable and disable installed Energy Advantage Architecture options
  4. **POWER MAPS:** Shows the power flow for the system via the UPS Power Map and shows UPM detail through the UPS Module Map (for the local UPS). In a parallel system, the System Overview displays the entire parallel system with the ability to access any UPS information in the system.
  5. **LOGS:** Displays the list of Active System Events and a historical log of system events. Historical logs shall include a detailed time stamped list of over 300 events. Events shall include detailed information including the description, source, type, and solution.  
  
Battery log shall include Time on Battery, Load on Battery, End Voltage, and Source (UPM). The battery log shall also include the Average Time and Total Time on Battery for each UPM.
  6. **STATISTICS:** This screen shall summarize the time on various modes for the current month, prior month, and since the last reset. This includes Online, Online ESS, Online VMMS, On Bypass and On Battery. A graphical comparison shall show the consumption in Double Conversion Mode and ESS, along with estimated savings.

7. **SETTINGS:** Allows configuration of the unit including meters format, ESS and VMMS configuration, backlight adjustments, display contrast, date and time information, serial communication port configuration, and display of firmware revision numbers.
  8. **STATUS BAR:** A status across the top of the screen displays unit name, date/time, active alarms, system voltage and frequency, and battery levels. Two interactive buttons on the Status Bar allow for language changes and passcode input.
- D. **Control Panel Indicators:** The UPS display panel shall also include the following monitoring functions via indicator LED's:
1. **ONLINE:** This shall indicate that the commercial AC utility or generator source is supplying power to the rectifier and the inverter is supporting the critical load.
  2. **BYPASS:** This shall indicate that the UPS has transferred the load to the bypass circuit.
  3. **BATTERY:** This shall indicate that battery is supplying power to the inverter, which is supporting the load. A text message shall indicate if the battery charge is low or if the battery is installed but disconnected.
  4. **ALARM:** This shall indicate that the UPS detects an alarm condition, outlined in detail in the operator's manual.

## **2.08 COMMUNICATIONS**

- A. **Communications Bay:** The UPS shall be equipped with field configurable communications bays that will accommodate four (4) communication devices.
- B. **Remote Monitoring:**
  1. Optional WEB/SNMP communication capabilities will be available for all systems.
  2. The UPS shall be able to be monitored remotely via communications devices. UPS manufacturer shall provide optional communications devices capable of communicating via various industry standard protocols such as RS232, BACnet, and ModBus. Monitoring of UPS status may also be performed through isolated dry contact Form C relays.
  3. Remote monitoring of the UPS shall also be possible through status indicators elsewhere in the same facility through a device that replicates these indicators.

The UPS communication capability should be able to integrate into any industry standard Building Management System (BMS) and/or Network Management System (NMS). The UPS must also be able to be monitored via any standard Internet browser.

All optional hardware interfaces shall be "Hot-swappable" (UPS maintains power to critical applications while changing interfaces).

C. Shutdown:

1. There shall be a mechanism that provides graceful, orderly, unattended, sequential shutdown of one or multiple computers powered by one UPS. This shutdown shall be performed via in-network or out-of-network means. The order of shutdown shall be user-defined, allowing the maximization of runtime on battery for more critical systems.
2. Shutdown of AS/400 computers shall be possible through open-collector relay contacts or isolated, dry contact, Form-C relays.
3. The UPS shall also be capable of interfacing with an operating system's built-in shutdown routine. This shall be done through a cable connection to the optional network port on the UPS.

D. Notification:

1. There shall be a mechanism to send alerts to key personnel via email or SNMP traps. An alarm notification may also be sent by a network message.
2. Network access to a computer for alarm notification may be provided. The user may respond by connecting via the network to retrieve alarm history and a summary of current meter status.
3. Management: A remote battery test may be performed via an Ethernet network. The UPS shall be tested through invocation of a single command.

## **2.09 UPS PROTECTION**

- A. Rectifier/Charger and Bypass protection shall be provided through fusing.
- B. Battery protection shall be provided by thermal-magnetic molded-case circuit breakers in each battery cabinet (if standard battery pack is provided) or external protective device for an external battery.
- C. Electronic current limiting circuitry and fuses in the Inverter circuit shall provide output protection.
- D. To comply with agency safety requirements, the UPS shall not rely upon any disconnect devices outside of the UPS to isolate the battery cabinet from the UPS.

## 2.10 OUTPUT DISTRIBUTION SECTION

- A. Panelboards: Comply with Section 262416 "Panelboards," except provide assembly integral to UPS cabinet. Refer to drawings for panelboard configuration and arrangement.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

### 3.02 COMMISSIONING

- A. Factory start-up shall be provided on a 7 x 24 basis. Start-up service shall be provided at no extra charge and shall include one visit to perform all procedures and tests specified within UPS Installation and Operation manual. UPS manufacturer shall also offer the following optional services:
  - 1. Pre-energize visit to inspect installation and provide guidance to installers as required.
  - 2. Post-start-up visit for alarm notification configuration, operator training, generator testing, etc.
- B. The following procedures and tests shall be performed by Field Service personnel during the UPS startup:
  - 1. Visual Inspection:
    - a) Visually inspect all equipment for signs of damage or foreign materials.
    - b) Observe the type of ventilation, the cleanliness of the room, the use of proper signs, and any other safety related factors.
  - 2. Mechanical Inspection:
    - a) Check all the power connections for tightness.
    - b) Check all the control wiring terminations and plugs for tightness or proper seating.
  - 3. Electrical Pre-check:
    - a) Check the DC bus for a possible short circuit.
    - b) Check input and Bypass power for proper voltages and phase rotation.

- c) Check all lamp test functions.
- 4. Initial UPS Startup:
  - a) Verify that all the alarms are in a “go” condition.
  - b) Energize the UPS module and verify the proper DC, walkup, and AC phase on.
  - c) Check the DC link holding voltage, AC output voltages, and output waveforms.
  - d) Check the final DC link voltage and Inverter AC output. Adjust if required.
  - e) Check for the proper synchronization.
  - f) Check for the voltage difference between the Inverter output and the Bypass source.
  - g) Optional internal load testing: The UPS system will be capable of utilizing the Easy Capacity Test (ECT) function, including internally adjustable load testing at the customer site, without the need for a load bank. Testing shall only be initiated using the Eaton Engineer’s Software Service Tool. This testing is not intended to be performed while the UPS is servicing the critical load
- 5. Operational Training: Before leaving the site, the field service engineer shall familiarize responsible personnel with the operation of the UPS. The UPS equipment shall be available for demonstration of the modes of operation.

### **3.03 CONNECTIONS**

- A. Ground and bond UPS systems.
- B. Tighten connector and terminal bolts according to the manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

**END OF SECTION**

## **SECTION 263600 - 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.

#### **1.3 ACTION 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.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For manufacturer and testing agency.
- B. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." 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."
    - 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."
  - 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.

## **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "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.

## **1.6 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. Source Limitations: Obtain automatic transfer switches 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. Comply with NEMA ICS 1.
- E. Comply with NFPA 70.
- F. Comply with NFPA 99.
- G. Comply with NFPA 110.
- H. Comply with UL 1008 unless requirements of these Specifications are stricter.

## **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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



1. ASCO Power Technologies/Schneider Electric
2. GE Zenith Controls.
3. Russelectric, Inc.
4. Kohler Power Systems; Generator Division.
5. Onan/Cummins Power Generation; Industrial Business Group.
6. Caterpillar; Engine Division
7. 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. Switch shall be able to withstand a three-phase rms fault current for three cycles without the use of series current limiting protection devices.
- C. Molded Circuit Breaker: The building distribution system and the power generation system circuit breakers shall be coordinated with the withstand/closing ratings (WCR) of the transfer switch used with specific manufacturer's circuit breakers in accordance with ratings indicated on plans.
- D. 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.
- E. 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.
- F. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- G. 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.
- H. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

- I. 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 Section 260553 "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.

### **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. 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.
- D. Automatic Transfer-Switch Features:
  1. Undervoltage 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 undervoltage 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: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. 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.
13. 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.

## **2.4 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 Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Identify components according to Section 260553 "Identification for Electrical Systems."
- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

### **3.2 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."

### **3.3 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 installation, including connections, and to assist in testing.
  - 2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
    - a. Simulate loss of phase-to-ground voltage for each phase of normal source.
- C. Testing Agency's Tests and Inspections:
  - 1. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
    - a. Simulate loss of phase-to-ground voltage for each phase of normal source.
- D. Coordinate tests with tests of generator and run them concurrently.
- E. 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.
- F. Remove and replace malfunctioning units and retest as specified above.

### **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 Section 017900 "Demonstration and Training."
- B. Coordinate this training with that for generator equipment.

**END OF SECTION**

**Union County Division of Engineering**  
**Union County Dispatch Center Area Expansion**  
Froehlich Building - North Avenue Westfield, NJ  
PS&S # 030090002

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**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.

**1.3 DEFINITIONS**

- A. Nominal: 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, Nominal 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 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Schneider Electric Industries SAS.
  - 2. Advanced Protection Technologies Inc. (APT).
  - 3. Eaton Corporation.
  - 4. Emerson Electric Co.
  - 5. GE Zenith Controls.
  - 6. LEA International; Protection Technology Group.
  - 7. Leviton Manufacturing Co., Inc.
  - 8. PowerLogics, Inc.
  - 9. Siemens Industry, Inc.
  - 10. Approved Equal.

**2.2 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 at least 125 percent of the nominal system voltage.

### **2.3 SERVICE ENTRANCE SUPPRESSOR**

- A. SPDs: Comply with UL 1449, Type 1.
- B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1
  - 1. SPDs with the following features and accessories:
    - a. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
    - b. Indicator light display for protection status.
    - c. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
    - d. 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 200 kA. 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 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 700 V for 208Y/120 V.
  - 2. Line to Ground: 1200 V for 208Y/120 V.
  - 3. Line to Line: 1000 V for 208Y/120 V.
- F. SCCR: Equal or exceed 200 kA.
- G. Nominal Rating: 20 kA.

### **2.4 PANEL SUPPRESSORS**

- A. SPDs: Comply with UL 1449, Type 2.
  - 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.
- B. 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.



- C. Comply with UL 1283.
- D. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 700 V for 208Y/120 V.
  - 2. Line to Ground: 700 V for 208Y/120 V.
  - 3. Neutral to Ground: 700 V for 208Y/120 V.
  - 4. Line to Line: 1200 V for 208Y/120 V
- E. SCCR: Equal or exceed 100 kA.
- F. Nominal Rating: 20 kA.

## **2.5 Branch Circuit Suppressor**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton Corporation or comparable product by one of the following:
  - 1. DITEK Surge Protection.
  - 2. Eaton Corporation.
  - 3. Emerson Electric Co.
  - 4. GE Zenith Controls.
  - 5. Current Technology.
  - 6. Leviton Manufacturing Co., Inc.
  - 7. Schneider Electric Industries SAS.
  - 8. Siemens Industry, Inc.
  - 9. Eritech; Erico International Corporation.
  - 10. Or Approved Equal.
- C. SPDs: Comply with UL 1449, Type 2.
- D. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Third Edition, Type 2
  - 1. SPDs with the following features:

- a. Approved for 20A circuit breakers.
  - b. Diagnostic LED indicates ground presence, system power and SPD function.
  - c. Retain first subparagraph below to disconnect the SPD when low-current, high-impedance faults occur.
- E. Comply with ANSI/IEEE C62.41 and C62.45.
- F. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall be in accordance with table below.
- G. Equipment Ampacity Rating Surge Current Rating Per Phase
- |                     |         |
|---------------------|---------|
| H. 20 Amps or below | 19,500A |
|---------------------|---------|
- I. The SPD shall include discrete 3 modes of protection (L-G, L-N, and N-G). Protection modes and UL 1449 VPR for grounded single phase 120V circuits shall not exceed the following:
- 1. Line to Neutral: 700 V for 120 V.
  - 2. Line to Ground: 700 V for 120 V.
  - 3. Neutral to Ground: 700 V for 120 V.
- J. Operating Frequency: 0 Hz to 400 Hz.
- K. SCCR: Equal or exceed 10 kA.
- L. Nominal Rating: 3,000A.

## **2.6 ENCLOSURES**

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R.

## **2.7 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. 22 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. 16 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**

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## **SECTION 265119 - LED INTERIOR LIGHTING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Furnish all labor, materials, equipment and incidentals required to provide lighting fixtures including Light Emitting Diode (LED) lighting fixtures as shown on Drawings and as specified herein, including but not limited to the following:
  - 1. Interior solid-state luminaires that use LED technology.
  - 2. Lighting fixture supports.
- B. Related Requirements:
  - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

#### **1.2 DEFINITIONS**

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire 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.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

#### **1.4 INFORMATIONAL SUBMITTALS**

A. Product Certificates: For each type of luminaire.

B. Sample warranty.

#### **1.5 CLOSEOUT SUBMITTALS**

A. Operation and maintenance data.

#### **1.6 WARRANTY**

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

#### **2.2 LUMINAIRE 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. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of minimum 80. CCT of 3000 K .
- F. Rated lamp life of 35,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: 120 V ac unless otherwise indicated.
  - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- J. Housings:
  - 1. Extruded-aluminum housing and heat sink.
  - 2. Clear finish.

### **2.3 MATERIALS**

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers, and Globes:
  - 1. Tempered Fresnel glass prismatic glass diffuse glass clear glass prismatic acrylic clear, UV-stabilized acrylic.
  - 2. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 3. Glass: Annealed crystal glass unless otherwise indicated.
  - 4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Housings:
  - 1. Extruded-aluminum housing and heat sink.
  - 2. Clear finish.

## **2.4 METAL FINISHES**

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

## **2.5 LUMINAIRE SUPPORT COMPONENTS**

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to a minimum 20 gauge backing plate attached to wall structural members.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
  - 1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
  - 2. Ceiling mount with pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
  - 3. Ceiling mount with hook mount.



- H. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
  - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.
- K. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### **3.2 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

**END OF SECTION 265119**

**SECTION 311500 - TRAFFIC CONTROL**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General & Supplementary Conditions.

**1.2 SUMMARY**

- A. The Contractor will not be allowed to close any roadways to traffic without express written permission from authorities having jurisdiction. The Contractor shall plan and carry out its work to provide for the convenient and safe passage of all vehicular and pedestrian traffic.
- B. All costs involved shall be borne by the Contractor.
- C. It is the Contractor's responsibility to coordinate its work with the Owner to ensure the safe passage of vehicular and pedestrian traffic throughout the project limits, at certain times, until final acceptance of the project by the Engineer. This includes the installation of temporary pedestrian-safe walkways as directed by the Owner.
- D. Maintenance and protection of traffic with minimum interference are of the first importance. The Contractor shall provide, and maintain to the satisfaction of the Owner and/or Engineer, adequate and safe means for passage of vehicular and pedestrian access to all areas of the subject property. There shall be no disruption of access to nearby parking areas, or buildings adjoining or affected by the work, unless authorized in advance by the owner. Sufficient width shall be provided in all traffic lanes to allow safe and convenient turning through them, and the outside edges shall be plainly marked by lights, or other devices approved by the Engineer. The Contractor shall notify the Owner at least 48 hours prior to the time it proposes to begin any work which will interfere with the normal passage of pedestrians and vehicles. Pavement areas shall be kept clean of construction materials at all times.
- E. The Contractor shall provide adequate means of access for fire, police, and emergency vehicles throughout the duration of the project.
- F. Traffic shall be maintained along public roadways during construction. At least one 12-foot lane shall be maintained for traffic during all construction periods and at least two 12 foot lanes at all other times.
- G. Competent watchmen and flag men shall be employed by the Contractor for the protection of any equipment entering, leaving or crossing active traffic lanes or as may be required for the routing of any traffic around or through the construction. Watchmen and flag men will be employed by the Contractor at its own expense.
- H. Install warning cones and barricades along work being performed on or near public roadways to the satisfaction of the local police traffic safety officer. Contact the local police traffic safety office at the commencement of construction for traffic control requirements along public roadways. All cones, signs and barricades must conform to the Manual of Uniform Traffic Control Devices (MUTCD).
- I. Traffic control signage when shown on the drawings has been prepared in accordance with the Manual of Uniform Traffic Control Devices (MUTCD). The installation of all signage shown on the drawings includes, materials, labor, equipment, delivery, hardware, etc., necessary and incidental thereto.

## **PART 2 - PRODUCTS**

### **2.1 TRAFFIC CONTROL DEVICES**

- A. Before beginning work on any stage of the project, the Contractor shall furnish and install all specified warning signs, barricades, wood traffic guides, lights, flares, and other devices necessary, in the opinion of the Engineer and/or the local police department, to protect the public during that phase of its operations.
- B. All regulatory and warning signs shall be in accordance with Chapter 6 of the Manual on Uniform Traffic Control Devices, latest Edition, and shall be supplied and installed by the Contractor as directed by the Engineer. When such signs are no longer required, the Contractor shall immediately and carefully remove and store them on the project site at locations approved by the owner until they are reused on the project or removed by the Contractor.
- C. Barricades shall be painted with diagonal orange and white stripes. The orange color used on barricades shall conform to standard colors as shown on highway color tolerance charts published by the Federal Highway Administration. Conformance will be visually determined by comparison with the highway color tolerance charts using the Munsell Notation according to ASTM D1535. Color tolerance charts are on file in the office of the Department's Sign Architect at 1035 Parkway Avenue, Trenton, New Jersey. Type III A barricades shall not be used adjacent to traffic lanes.
- D. Traffic cones shall be of plastic or rubber, of 28-inch minimum overall height, 1-3/4 inch minimum outside diameter at the top, and 7-1/2 inch minimum outside diameter at the bottom tapering to a 14-inch minimum square base. The minimum weight of the cones shall be 7 pounds exclusive of attachments. They shall be reflective orange with the color molded into the plastic. They shall be kept clean and bright for maximum target value. Traffic cones shall be reflectorized and may be equipped with steady burning lights for nighttime use, if so directed by the Engineer. The cones shall be subject to the Engineer's approval before and during the time of their use on the project.
- E. Low intensity battery operated flashing warning lights shall conform to the Specifications on file at the office of the NJ DOT Department's Bureau of Safety, 1035 Parkway Avenue, Trenton, New Jersey. These Specifications require, in part, that the flashing lights be weather-proof, and reasonably tamper-proof and theft-proof; be equipped with a 7-inch minimum diameter yellow plastic lens; shall operate with a flash rate between 55 and 75 flashes per minute with a flash duration of not less than 18 percent of each flash cycle; each light shall have a minimum effective intensity of 10 candle power and shall be inspected and cleaned daily so as to maintain the lights in proper working condition.
  - 1. High intensity battery operation flashing warning lights shall conform to the Specifications therefore on file at the office of the NJ DOT Department's Bureau of Safety, 1035 Parkway Avenue, Trenton, New Jersey. These Specifications require, in part, that the flashing lights be weatherproof, and reasonably tamper-proof and theft-proof; be equipped with a 7-inch minimum diameter yellow plastic lens; shall operate with a flash rate between 55 and 75 flashes per minute and have a minimum effective intensity of 100 candle power and shall be inspected and cleaned daily so as to maintain the lights in proper working condition.
  - 2. Flashing warning lights and steady burn lights shall be installed and maintained at such locations as the Engineer or municipal officials may determine are necessary to adequately warn oncoming traffic of the existence of the work zone.
  - 3. Steady burning lights and low intensity flashing warning lights shall be kept lit from 1 hour before sunset until 1 hour after sunrise, and through all hours of fog, smog, and other adverse atmospheric conditions affording insufficient visibility for the safe operation of traffic. High intensity warning lights shall be operated 24 hours per day.

- F. No work which will interfere with traffic, or restrict the width of pavement available for traffic, shall be performed on Saturdays, Sundays or legal holidays, without prior approval by the Owner.
- G. Except as necessary during actual working hours, and then only with the specific approval of the Owner or Engineer, the Contractor shall not occupy with his equipment, materials or personnel, any roadway or sidewalk area within or adjacent to the project that is open to pedestrian or vehicular traffic.
- H. Competent, trained, and uniformed traffic directors shall be employed at every point where the Contractor's equipment is working immediately adjacent to or is entering, leaving or crossing active traffic lanes. The traffic directors shall be employed continuously for the full time such conditions exist as determined by the Engineer. Traffic directors will be employed by the Contractor at his own expense.
  - 1. The contractor shall contact the local police department to obtain any local requirements for traffic control along public roadways. The contractor shall adhere to whatever traffic control requirements are set forth by the local police department, including but not limited to the part-time hiring of off-duty police officers for traffic control duty at the entrance to the campus. Traffic directors (off-duty police officers) will be employed by the Contractor at its own expense. Determine these costs and include them in the contract.
- I. All signs shall be furnished, erected, and maintained in a substantial manner to be approved by the local police department, and shall be maintained so as to provide maximum visibility and legibility at all times.
- J. Signs, lights, barricades, and all other warning and protective devices shall be established, repaired, relocated, and removed by the Contractor at the locations and times and in the manner directed by the Engineer or local police department having jurisdiction.
- K. Wherever a detour may be established, the Contractor shall obtain approval two weeks in advance from the local police department and shall provide warning signs as necessary in accordance with Chapter 6 of the MUTCD.
  - 1. Should the Contractor feel additional detours are necessary, it will be its responsibility to get prior approval from the Municipality, in the case of local roads or from the State, in the case of State highways, or from the County, in the case of County roads, to route traffic on or off their roads. In addition, the Contractor will be responsible for notifying local police, school boards, fire companies, first aid units, etc., of the detour, prior to its inception, as a condition of approval by the Engineer.
  - 2. If the Contractor uses drums to delineate traffic hazards on the project site, such drums shall be of steel or plastic, approximately 36 inches high and a minimum of 18 inches in diameter. They shall have alternating orange and white reflective stripes, with a minimum of two white stripes per drum. Ballast weight shall not exceed 50 pounds. A drain hole shall be provided near the bottom of the drum to prevent the accumulation of rainwater.
- L. Permanent Signs:
  - 1. Signs adjacent to curbed driveways, aisles or parking lots shall not be closer than 2 feet to the face of curb. Signs adjacent to pavement (no curb) shall not be less than 12 feet from the edge of traveled way.
  - 2. Mounting heights for signs shall be no less than 7 feet measured from the bottom of sign to the nearest pavement. The bottom of a secondary sign mounted below another sign as noted above may be one foot less than the appropriate height noted above.

**2.2 METHOD OF MEASUREMENT**

- A. No separate payment will be made for Supply, Maintenance and Protection of Traffic as described above and in the MUTCD. Payment for all installation, maintenance, lighting, relocation, maintaining breakaway barricades, lights, torches, sandbags, construction signs, traffic cones, drums, vertical panels, barricades Type I, II or III with flashers, provisions for temporary driveways, sidewalks with soil aggregate, Class I-2; temporary curb, temporary bituminous pavement, and all else necessary for and incidental to the maintenance and protection of traffic shall be included in various items listed in the Proposal.
- B. No separate payment for uniformed traffic directors will be made; the cost of which will be included by the Contractor in the price bid for the various items in the proposal.
- C. No separate payment will be made for the items as hereinbefore described including but not limited to, installation, maintenance in good condition, relocation, removal, and disposal of all the items as hereinbefore described; all materials, labor, equipment, and all else necessary therefore or incidental thereto for completion of this item as specified herein.

**PART 3 - EXECUTION**

**3.1 EXECUTION**

- A. Maintenance and protection of traffic shall be coordinated with local authorities. Adhere to all traffic control requirements established by the local police department and other regulatory bodies having jurisdiction.
- B. All traffic control devices shall be in operation prior to the commencement of any construction activities in the traveled way.
- C. Any traffic control devices which are lost, stolen, destroyed or deemed unacceptable while their use is required on the project, shall be replaced by the Contractor without additional compensation. Any additional control devices required by field conditions shall be supplied by the Contractor without additional compensation.

END OF SECTION

## **SECTION 312000 - EARTH MOVING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

#### **1.2 SECTION INCLUDES**

- A. Provide earthwork & grading required for the project, including:
  - 1. Unclassified Excavation, subgrade soil removal, replacement fill, backfill and compaction to provide suitable subgrades for pavement construction.
  - 2. Unclassified Excavation fill and earthmoving to provide site subgrades required by finish grades shown in sidewalk areas, and along the edge of construction.
  - 3. Drainage fill course (min. 4" thickness) under all new walkways on grade, under concrete paving, and elsewhere as indicated, to provide a capillary break.
  - 4. Additional bank run sand fill materials as required.
  - 5. Removal and disposal of excavated material not required for, or not suitable for, the work.
  - 6. Backfilling voids resulting from the removal and disposal of existing underground obstructions.
  - 7. Design and engineering of shoring, sheet piling and bracing related to earthwork.
  - 8. Grading & preparation of subgrade soils in areas that are to become lawn.
  - 9. Subgrade reconstruction shall be provided as needed in accordance with the plans and with Owner's approval.

#### **1.3 RELATED SECTION**

- A. Division 02: For disposal of excess material
- B. Division 32: Soil Preparation

#### **1.4 REFERENCED STANDARDS**

- A. ASTM - American Society for Testing and Materials.
  - 1. D2487 Test Method for Classification of Soils for Engineering Purposes.
  - 2. D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
  - 3. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - 4. D2167 Field Density Tests, Rubber Balloon Method.
  - 5. D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth).

#### **1.5 SUBMITTALS**

- A. Compliance: Submit the following documentation to the Engineer:
  - 1. Schedule for earthwork operations.
  - 2. Location of site receiving spoil material and certification of acceptance.

3. Test reports on borrow material and screened topsoil.
4. Proof of scheduling and coordinating earthwork activities with the geotechnical (soils) engineer and testing and inspection company. Provide daily compaction reports on a weekly or semi-weekly basis verifying conformance with the project specifications.

#### **1.6 QUALITY ASSURANCE**

- A. Contractor shall provide a soils gradational analysis, from the supplier, of any imported soil fill (or on-site soil fill) to be used as structural fill under pavements.
- B. The contractor is responsible for determining all earthwork quantities needed to establish the lines and grades shown on the construction drawings.
- C. The contractor is responsible for determining the amount of onsite soils which are unsuitable and/or in excess of what is required by the construction drawings.
- D. Debris and other waste material shall be disposed of offsite in a legal manner.

#### **1.7 REGULATORY REQUIREMENTS**

- A. Comply with the applicable provisions of codes, standards and specifications referenced in this section.

#### **1.8 PRODUCT HANDLING**

- A. Handle and transport materials to avoid dropping and dispersion of material onto public rights of way or other areas outside of the construction area.
- B. Promptly remove materials deposited or eroded onto areas described above, and leave area clean.
- C. Maintain segregation of dissimilar materials.

#### **1.9 PROJECT CONDITIONS**

- A. Existing Utilities:
  1. Protect existing sewers and utilities noted to remain. Provide adequate means of support and protection for remaining utilities during earthwork operations.
    - a. Existing utilities shown on Drawings are based on as built documents provided by the Owner and visual field observations. All locations are represented as approximate.
    - b. If excavation locates existing utilities which are to remain and if such utilities are not located as shown on Drawings, record locations and identifications of utilities on Record Document drawings. Provide same information to the Architect / Engineer.
    - c. Adhere to other utility location requirements specified in other sections of the specifications.
  2. Uncharted, or incorrectly charted, piping or other utilities: If encountered during excavation, consult utility owner immediately for directions. Cooperate with utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  3. Do not interrupt existing utilities or sewers serving facilities occupied and used by Owner or others, at any time, except when notice has been filed, permission granted, and other conditions satisfied as specified in appropriate Division 01 Section.
  4. Refer to Pre-demolition work as it pertains to utility locations and mark-out.

- C. Use of explosives is not permitted.
- D. Protection of Persons and Property:
  - 1. Perform earthwork operations only after installation of temporary construction fencing, perimeter safety barricades, warning lights and other protective measures as specified and as required by authorities having jurisdiction. Maintain protective measures in fully effective condition throughout the period of earthwork operations.
  - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. This includes the erection of temporary wooden framing to support adjacent structures during trench excavations.
  - 3. Perform excavation within drip-line of large trees to remain by hand and protect the root system from damage or dry out. Maintain moist condition for root system and cover exposed roots with wet burlap. Paint root cuts of 1-inch diameter and larger with emulsified asphalt tree paint.
  - 4. On-site soils which contain more than 10% silt and clay may be difficult to re-handle is allowed to become saturated during rainy periods. Hence, means and methods should be employed to protect the soils from being saturated.

#### **1.10 DEFINITIONS**

- A. Earth - Soil, clay, loose stone, hard pan, abandoned foundations, abandoned piping, concrete and masonry rubble, broken paving and other materials, with the exception of boulders and solid rock which require drilling or blasting, or both for removal.
  - 1. Intermittent drilling or ripping performed to increase excavation production shall be considered earth excavation.
- B. Rock Excavation: Consists of the removal and disposal of materials that cannot be excavated using equipment with the same weight and horsepower capacity as a fully operational Caterpillar Excavator Model 330, with a 1-½ cu. yd. bucket, without the need to drill or blast.
  - 1. Typical Rock Material shall be Boulders 1-1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock hard cementitious aggregate deposits.
    - a. Rock excavation shall not include any intermittent drilling or ripping performed to increase production.
    - b. Rock payment lines shall be limited to the following:
      - i. Two feet outside of concrete work for which forms are required, except footings.
      - ii. One foot outside the face of footings.
      - iii. In pipe trenches, 6" below the pipe invert elevation and two feet wider than the inside pipe diameter, but not less than a three-foot minimum trench width.
      - iv. Neat outside dimensions of concrete work where no forms are required.
      - v. Under slabs on grade, 6" below bottom of concrete slab.
- C. Suitable Material - Earth, which is capable of being compacted to the required density at the proper moisture content, and which is free of topsoil, roots, trash, debris, frozen material, organic matter and other foreign matter, and has a pH between 5 and 6.5. The size limit of rock as suitable material shall not exceed 4 (four) inches in size. The remainder of rock shall be classified as unsuitable.
- D. Unsuitable Material - Material not classified as "suitable".
  - 1. On site bituminous concrete shall be considered unsuitable material and shall be disposed of off-site in a legal manner.



## **PART 2 - PRODUCTS**

### **2.1 MATERIAL AVAILABILITY**

- A. On-site soils are suitable for re-use by the contractor, only in strict conformance with the recommendations of the geotechnical engineer hired by the Owner. Refer to 1.09A above.

### **2.2 DRAINAGE FILL SUBBASE**

- A. Beneath Portland Cement Concrete: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inches sieve and not more than 5 percent passing a No. 4 sieve. Compacted to 95% MPD.

### **2.3 WATER**

- A. Provide water as required to assure proper moisture content for compaction of all subgrade soils and subbase material as specified.

## **PART 3 - EXECUTION**

### **3.1 EROSION CONTROL**

- A. Install and maintain all Soil Erosion & Sediment Control measures including silt fence prior to land disturbance and maintain throughout the duration of the project until permanent vegetation is established.
- B. Do not permit excavated soils to wash onto roadways or adjacent areas.
- C. Wash and sweep hard surfaces around the site daily to keep dust and scattered soil debris to a minimum.

### **3.2 EXCAVATION**

- A. General Site Excavation is Unclassified, and includes excavation to provide required elevations indicated, regardless of character of materials and obstructions encountered. Perform all site excavation, rough grading, compaction, proof-rolling and placement of fill as needed to achieve the required finished plan elevations. If underground obstructions are encountered during earthwork operations and said obstructions are abandoned and serve no purpose, remove said obstructions to provide suitable clearances for underground utility lines and new surface improvements.
- B. Unsuitable clean fill material may be reused as surface fill around new construction to establish required subgrades prior to the placement of screened topsoil. All excess unsuitable fill that cannot be re-used shall be removed from the project site and disposed of in a legal manner off-site.
- C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction. Unauthorized excavation, and remedial work shall be at Contractor's expense.
  - 1. Backfill and compact other unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed.
- D. Soft soils should be locally removed and replaced with suitable material as defined herein. In no case shall the size of any particles exceed 4 inches in diameter.

- E. Stability of Excavations: Slope sides of excavations to comply with codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- F. Shoring and Bracing:
  - 1. Comply with local codes and authorities having jurisdiction. Provide materials in good serviceable condition.
  - 2. Provide performance verification, in accordance with the provisions of Part 1 of this section.
  - 3. Maintain shoring and bracing in excavations throughout period when excavations are open. Carry down shoring and bracing as excavation progresses.
- G. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- H. Inclement Weather Protection:
  - 1. Protect all excavations and earthwork areas from damage caused by weather. Maintain smooth site grading throughout construction to insure the proper conveyance of overland storm water flow patterns. Standing water shall not be permitted at any time.
  - 2. Soils damaged by excessive saturation or other contamination shall be replaced with Granular Material, or as specified by the Engineer at the contractor's expense.

### **3.3 DEWATERING**

- A. Prevent surface water and subsurface water from flowing into excavations and construction areas and surrounding area. Perform any or all of the following means to divert water from construction areas:
  - 1. Install a temporary diversion along the limits of construction to re-direct surface runoff.
  - 2. Use a bypass pumping system to de-water trenches and foundations.
- B. Do not allow water to accumulate in excavations. De-watering operations shall be continuous throughout the excavation and subsequent fill operations. Remove water to prevent softening of foundation bottoms 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.
- C. Establish and maintain temporary drainage ditches, pipes, and other diversions to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- D. Dewatering of all excavations shall be included in scope of work. Employ the use of filtration measures as required by the soil conservation district to avoid discharging silt laden material into receiving storm sewers and waterways.

### **3.4 MATERIAL STORAGE**

- A. Stockpile excavated materials to be re-used until required. Place, grade and shape stockpiles for proper drainage within the limits of silt fence sediment barrier.
- B. Locate soil storage away from edge of excavations. Do not store within drip line of trees required to remain. Do not store where erosion could result in siltation of excavations, drainage systems, or off-site areas.

- C. Establish and identify separate stockpiles for:
  - 1. Soils suitable for re-use applications.
  - 2. Soils suitable for re-use in landscape areas only.
  - 3. Unsuitable soils accepted for re-use in specific areas.
- D. Promptly remove from the site materials not accepted for re-use.
- E. If severe weather is forecast, which could result in site flooding, the contractor shall remove from the site, all fill piles, surface debris, and other materials that could become dislodged and become buoyant during flooding conditions. All materials shall be stored above the lowest floor elevation of the existing school.

### **3.5 FILL AND BACKFILL**

- A. When performing earthwork in new construction areas, strip all existing topsoil from within and 5 feet beyond all work areas and stockpile same for later re-use in lawn areas. Topsoil is not suitable bearing material for pavements. Do not place fill over existing top soil.
- B. Existing in-place subgrade soils within proposed pavement areas and 5 feet beyond shall be compacted in place to maximum densities. Subgrade soils remaining shall be thoroughly.
- C. Verify that subgrade complies with specified characteristics, including composition, elevation, thickness, and compaction.
- D. Place all fill material in layers to required subgrade elevations, for each area classification.
- E. Backfill excavations as promptly as work permits, but not until completion of the following:
  - 1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
  - 2. Removal of trash and debris.
- F. Ground Surface Preparation:
  - 1. Remove vegetation, debris, unsuitable materials, obstructions, and deleterious materials from ground surface prior to fine grading and the placement of topsoil. Plow strips, or break-up, sloped surfaces steeper than 1 vertical to 4 horizontals so that topsoil material will bond with existing surface.

### **3.6 COMPACTION**

- A. Moisture Control:
  - 1. Control moisture content of material which shall be compacted to permit compaction at a moisture content within 2 percent of the applicable optimum moisture content.
  - 2. If material becomes too wet for the required compaction, dry material before starting or continuing compaction operations.
  - 3. If material becomes too dry for the required compaction, moisten material before starting or continuing compaction operations.

- B. Verify degree of compaction of subgrade and each lift. Do not place successive lift until previous lift is inspected and verified. Top of completed compacted fill shall be subject to final inspection and verification.
- C. Procedures:
  - 1. Using compacting equipment (not hauling equipment) make not less than six (6) passes over each section of each layer of fill. Make additional passes and variation in layer thickness if necessary, to obtain specified compaction. Each successive pass shall overlap the preceding adjacent pass by 10 percent. Roller passes made on material in unsuitable condition shall not be recognized in judging compliance.
  - 2. Use hand-held compacting equipment in areas not otherwise accessible.

### **3.7 GRADING**

- A. General: Uniformly grade areas within limits of grading, including transition to adjacent existing grades. Smooth finished surfaces within specified tolerances, with uniform levels or slopes between indicated elevation points, and between such points and existing grades.
- B. Finish surfaces free from irregular surface changes to match adjacent grades or as indicated on the drawings, and within the following tolerances of required subgrade elevations :
  - 1. Unpaved Areas:
    - a. Areas to receive topsoil: plus, or minus 2 inches.
    - b. Areas not to receive topsoil: plus, or minus 1-1/2 inches.
  - 2. Adjacent to walks and Pavements: plus, or minus 1/2 inch. Shape surface of areas under walks and pavements to line, grade and cross-section.
- C. The final graded surface shall be combed clean and free of debris, sticks, rocks, or foreign matter larger than one (1) inch in dimension. The Engineer will inspect the final grade and require restoration of any areas deemed to be unsatisfactory.
- D. Areas adjacent to walkways MUST be graded to provide a smooth transition. No abrupt drop-off or “ankle twisters” will be tolerated. These areas will be inspected by the Engineer for compliance.
- E. General site grading and slope requirements are intended to restore surfaces to original condition and adjacent grade unless otherwise directed by the Architect / Engineer in the field.

### **3.8 DRAINAGE FILL COURSE**

- A. Place minimum 4" thick processed stone under all slabs on grade, under all concrete paving, sidewalks and elsewhere as indicated.
- B. Place drainage fill material on controlled compacted fill subgrade in layers of uniform thickness, to indicated cross-section and thickness, or if not otherwise indicated, a minimum of 4 inches thick. Maintain optimum moisture content for compacting. Test compaction before constructing other improvements. Furnish test results to the engineer.
- C. Place material in a single layer, except when more than 6 inches thick, place in equal layers, each layer not more than 6 inches or less than 3 inches thick when compacted.

**3.10 MAINTENANCE**

- A. Protect newly graded areas from traffic and erosion.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Recondition completed compacted areas which are disturbed by subsequent construction operations or adverse weather. Scarify surface, re-shape, and compact to required density.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration.

**3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS**

- A. Remove excavated material classified as Unsuitable, except for unsuitable materials accepted for specific re-use, and dispose of same off-site in a legal manner.
- B. Excess Suitable and Accepted Unsuitable Excavated Material:
  - 1. Transport all excess material from the site and dispose of same in a legal manner.

END OF SECTION - 312000

**SECTION 321216 - ASPHALT CONCRETE PAVING**

**PART 1 GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

**1.2 SECTION INCLUDES**

- A. Provide asphalt concrete paving work of varying thicknesses and applications as noted on the construction drawings. Pavements will be classified using NJ DOT Superpave Hot Mix Asphalt mix designations.
- B. Construction of asphalt pavement bases.
- C. Bituminous Pavement markings.

**1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 01: Equipment & Materials
- C. Division 02: Selective Site Demolition
- D. Division 31: Site Clearing
- E. Division 31: Earth Moving

**1.4 REFERENCE STANDARDS**

- A. AASHTO - American Association of State Highway & Transportation Officials:
  - 1. M17.
  - 2. M20.
  - 3. M22.
  - 4. M82.
  - 5. M140.
  - 6. M208.
  - 7. M248.
- B. ASTM - American Society for Testing and Materials:
  - 1. D242.
  - 2. D946.
  - 3. D977.
  - 4. D2027.
  - 5. D2397.
  - 6. D3381.
  - 7. D3515.

C. FS - Federal Standard

1. TT-P-115.

D. NJ DOT - New Jersey State Department of Transportation, Standard Specifications for Roadway & Bridge Construction, latest edition.

## **1.5 SUBMITTALS**

A. Project Data: Provide copies of materials certificates signed by material producer (batch plant) and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

## **1.6 QUALITY ASSURANCE**

A. For all paving work, comply with NJ DOT standard specifications, latest edition, and with local governing regulations if more stringent than specified.

B. The thickness and density of all asphalt pavement courses constructed in the project shall be measured by the Materials Testing and Inspection Company and written report certifying compliance with the specifications shall be submitted.

C. Verify the subbase elevations across the footprint of paving with a pre-paving survey after base has been tested for compaction. Adjust elevations of the base course. Align new pavement with adjacent pavement grade elevations.

## **1.7 REGULATORY REQUIREMENTS**

A. Comply with the applicable provisions of codes, standards and specifications referenced in this section.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Surface Course: Aggregate used in the surface course shall consist of crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand. The surface course shall be NJ DOT Hot Mix Asphalt Mix 9.5M64, with the intent of matching the existing pavement as indicated on the drawings.

C. Bituminous Stabilized base course, NJ DOT Hot Mix Asphalt Mix 19M64, as indicated on the construction drawings. Standard NJ DOT aggregate composition and gradation shall apply.

D. Leveling course: NJ DOT HMA 4.75M64 may be used as a thin lift leveling course to adjust base course irregularities before paving the final surface course.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M17 (ASTM D242).

F. Asphalt Cement: AASHTO M226 (ASTM D3381) for viscosity-graded material and AASHTO M20 (ASTM D946) for penetration-graded material.

- G. Traffic Markings: All pavement markings shall be thermoplastic. Barrier free (ADA) markings shall be cyan, parking stalls shall be white, and "no parking" area markings shall be yellow. Markings shall be placed where noted on the site plan and shall conform to Federal Specification TT-E-489 -595. Replace all existing striping and pavement markings in public roadways where pavement has been removed, in kind, with what existed previously to a like new condition. Black out existing linework as needed to clearly delineate the new markings.
- H. Traffic Signs & Handicapped parking signage: including all materials, posts, bollards, hardware, labor, equipment and all else necessary to install the signage where indicated on the plans.

## **2.2 ASPHALT-AGGREGATE MIXTURE**

- A. Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with new NJ DOT Standard Marshal Mix designations, ASTM D3515 and as recommended by local paving authorities to suit project conditions. Air void content shall be between 2 and 8 percent based upon the maximum theoretical specific gravity per NJ DOT specifications.

## **2.3 PAVEMENT THICKNESS**

- A. Various pavement sections may be shown on the plan. The pavement sections shown will vary in degree of structural integrity.
  - 1. The Bituminous (Asphalt) Pavement shall consist of a stone subbase course, a stabilized base course and a surface (wearing) course. The thickness and mix designations shall be per plan.
  - 2. Pavement for temporary pavements shall be a single fine aggregate surface wearing course (FABC), measured at least 1.5 inches thick, placed upon a uniformly graded and firmly compacted dense graded aggregate or quarry processed (dust bound) stone subbase, measuring at least 4 inches thick.

## **PART 3 EXECUTION**

### **3.1 SITE CONDITIONS**

- A. Weather Limitations: Construct when ambient temperature is above 50 degrees F and when temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
  - 1. Construct asphalt concrete surface course when atmospheric temperature is above 50 degrees F and when base is dry. Base course may be placed when air temperature is above 30 degrees F and rising.
- B. Grade Control:
  - 1. The contractor shall take special measures to mark paving limits and check elevations at frequent intervals to ensure positive drainage.
  - 2. The contractor shall establish and maintain required lines and elevations to match existing grades and conditions to promote positive drainage.
  - 3. The contractor shall meet existing pavement surfaces flush along saw-cut limits and milling edges. The intent of the grading plan is for positive drainage to be maintained at all times.
- C. Provide traffic control during all paving operations.

### **3.2 PRE-PAVING PREPARATION**

- A. Saw cut the pavement along demolition limits in the areas shown at the prescribed depths.



- B. Remove all loose surface pavement in broken areas and compact subbase material to a firm and unyielding condition 95% MPD using vibratory compactors. If the area is large enough, use of a mechanical vibratory roller or compactor is preferred.
- C. Subgrade Preparation
  - 1. Construct the subbase and subgrade materials to the depth specified on the plans and compact the underlying soils to a firm and unyielding consistency or 95% dry density per ASTM D1557, under the supervision of the geotechnical engineer. Reconstruct any soft areas of the subgrade material using compacted suitable on-site materials or dense graded aggregate in accordance with the geotechnical engineer's requirements. Compact subgrade to 95% dry density per ASTM D-1557 to the depths indicated on the plans.
    - a. Dense graded aggregate size shall not exceed 3 inches in any dimension.
    - b. Dense graded aggregate should be well-graded with a mixture of fine, small and larger particles to provide a tightly compacted homogenous layer.
    - c. Apply herbicide to compacted subbase before applying prime coat or bituminous stabilized base course.
    - d. Discard subgrade and subbase materials that cannot be re-used off site in a legal manner.
  - 2. Apply Prime coat to subbase and construct bituminous stabilized base course per details.
- D. After all required subgrade areas have been reconstructed and bituminous stabilized base has been installed, sweep all pavement surfaces and wash with clean water to remove all loose particles before constructing the bituminous pavement overlay.

### **3.3 PLACING MIX**

- A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.
- B. 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.
- C. Pavement shall be placed in such a manner to insure continuous overland drainage flow to the nearest storm water collection point (inlet, manhole grate, or depressed curb opening).
- D. Ensure surface of pavement is clean prior to placement of subsequent courses. Clean surface and apply tack coat between base and top courses.

### **3.4 ROLLING**

- A. General: Begin rolling when mixture can bear roller weight without excessive displacement.
  - 1. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- B. 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.

- C. 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.
- D. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Spray watering may be used to accelerate cooling during summer months.
- E. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.
- F. Schedule paving operations to avoid impacting the existing traffic circulation.

### **3.5 QUALITY CONTROL**

- A. General: Coordinate with the Owner's Materials Testing and Inspection Consult 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 Engineer.
- B. Check grade, cross slope and surface uniformity of compacted subgrade with line levels or suitable alignment testing apparatus before placing drainage subbase fill course or final pavement courses. Verify tolerances of each successive pavement course in similar fashion.
- C. Thickness: In-place compacted thickness shall not be acceptable if it exceeds the following allowable variation from required thickness:
  - 1. Surface Course: plus or minus 1/4 inch.
  - 2. Stabilized Base Course: plus or minus 1/4 inch.
  - 3. Subbase Drainage Course: plus or minus 1/2 inch.
- D. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10 feet straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces shall not be acceptable if exceeding the following tolerances for smoothness.
  - 1. Wearing Course Surface: 3/16 inch.
- E. Pavement shall be placed in such a manner to insure continuous overland drainage flow without puddles or ponding of storm water
- F. Test the compaction and elevation (lines & grades) of underlying subgrade and subbase courses prior to the construction of each course and subsequent pavement courses. The areas shall be tested at sufficient intervals as determined by the geotechnical engineer to ensure that adequate compaction in all pavement areas has been achieved prior to paving. Provide certified test results to the engineer for acceptance at least 2 days prior to the scheduled paving operation.
- G. Joints between paving lanes shall be tight, uniform, and nondescript to permit surface waters to pass seamlessly from section to section. Heat and overdress joints to promote bonding and to inhibit long term joint separation and cracking.
- H. Bituminous pavement shall be flush with all sidewalks, depressed curbs, and slabs used for barrier free accessibility.

END OF SECTION - 321216

**SECTION 321313 - PORTLAND CEMENT CONCRETE PAVING AND CURBS**

**PART 1 GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

**1.2 SECTION INCLUDES**

- A. Provide cast-in-place Portland cement concrete paving required, walkways, slabs, and other concrete pavements.
- B. Contractor to establish lines and grades for construction stakeout by engaging the services of a licensed land surveyor or professional engineer in the State of New Jersey. Note designated spot elevations and slope requirements on the plan for all walkways and intersections with landings and other pedestrian areas. Intent is to match existing grades and adjacent work that is being matched / tied into.

**1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 01: Equipment & Materials
- C. Division 02: Selective Site Demolition
- D. Division 31: Site Clearing
- E. Division 31: Earth Moving

**1.4 REFERENCED STANDARDS**

- A. ASTM - American Society for Testing and Materials:
  - 1. A185.
  - 2. A615.
  - 3. A184.
  - 4. A307.
  - 5. A309.
  - 6. D-4632
- B. AASHTO - American Association of State Highway and Transportation Officials:
  - 1. M233.
- C. ACI - American Concrete Institute, Design of Concrete Mixes.
- D. NJ DOT Standard Specifications for Road and Bridge Construction, latest edition.

## **1.5 SUBMITTALS**

- A. Provide Data: Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

## **1.6 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with local governing regulations if more stringent than specified.
- B. Furnish to owner's representative, job-specific concrete batch plant tickets with quantities and mix proportions clearly indicated.
- C. Contractor to establish lines and grades for construction stakeout by engaging the services of a licensed land surveyor or professional engineer in the State of New Jersey.
  - 1. Layout work to provide positive drainage to drainage structures and match existing grades and tie in points. Provide positive overland drainage and ADA (barrier free) compliance. Provide grade stakes and set forms for concrete at appropriate intervals to ensure grades are met for a smooth tie into existing features. The as-built survey must demonstrate that required paving and sidewalk grades have been met and conform to existing conditions.
  - 2. Extreme care must be taken to ensure pavement is placed in such a manner to insure positive overland drainage can occur.
  - 3. The contractors' surveyors shall take additional spot elevations along paving limits where new work adjoins existing work to verify that positive drainage can occur. Construction limits shall be adjusted accordingly to suit field conditions.
- D. The location and elevation of all sidewalks, ramps, and other paving shall be established by a land surveyor or professional engineer licensed in the State of New Jersey. Contractor shall insure the correct alignment and positioning of constructed improvements.
- E. The contractor shall remove and reconstruct all work found to be poorly constructed, poorly finished, deficient, mis-aligned, damaged, or otherwise vandalized as determined by the engineer without additional cost.
- F. The contractor shall coordinate and schedule the installation of pole footings, concrete walkways, pad, etc., with other trades and contractors to ensure that newly constructed concrete is not damaged by activities of other trades. If necessary, postpone specific concrete construction in some areas until other trades have completed their work and the risk of damage is minimal.
- G. Contractor shall coordinate with the Owner's Materials Testing and Inspection Consultant to provide report of compliance for materials used in construction of concrete paving and curbs.

## **1.7 REGULATORY REQUIREMENTS**

- A. Comply with applicable provisions of codes, standards and specifications referenced in this section.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Forms: Steel, wood, or other suitable 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.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.
  2. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185.
1. Furnish in flat sheets, not rolls, unless otherwise acceptable to the Engineer. Use wire mesh in all concrete slabs, aprons, and sidewalk subject to frequent or occasional vehicle loading per the construction plans, minimum gage shall be 6X6-W2.9xW2.9
- C. Fiber Reinforcement: shall be nylon or blended nylon polypropylene fiber reinforcement.
- D. Geotextile Fabric: High modulus, woven geotextile fabric, ASTM D-4632-86, et al.

## **2.2 CONCRETE MIX, DESIGN AND TESTING**

- A. Comply with requirements of applicable Division 03 sections for concrete mix design, sampling and testing, and quality control, and as specified.
- B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:
1. Compressive Strength: 4000 psi, minimum at 28 days, unless otherwise indicated.
  2. Slump Range: 6 inches for concrete containing HRWR admixture (super-plasticizer), 3 inches for other concrete.
  3. Air Content: Use air-entraining admixtures to provide 5 percent to 8 percent.

## **PART 3 EXECUTION**

### **3.1 JOB CONDITIONS**

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic on the site as required for the Owner's use of the property and other construction activities that may be underway on the site.
- B. Concrete placed in areas subject to vehicle loading shall be a minimum 6 inches thick (or 8" if specified on plans) and reinforced with welded wire fabric or reinforcing steel bars as noted on the construction detail(s).
- C. When meeting existing construction with new work, align top of concrete surfaces.

### **3.2 SURFACE PREPARATION**

- A. Set forms to the lines and grades that are shown on the plans. For reconstruction without any grade adjustments reconstruct to original lines and grades.
- B. Remove trash, debris, and loose material from compacted subbase surface immediately before placing concrete.
- C. Place drainage fill material layer and compact subbase before placing concrete.

- D. Removal all water from subgrades, allow to dry thoroughly, re-compact as needed before the placement of concrete.
- E. Saw-cut adjoining surfaces to provide a smooth transition with new construction.
- F. Subgrades shall be thoroughly compacted to ensure maximum moisture-density criteria is established. See "C" above.
- G. Concrete shall not be placed in wet forms or on saturated surfaces.

### **3.3 FORM CONSTRUCTION**

- A. Set forms to required grades and lines, rigidly braced, and secured. Install in sufficient quantity, forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed form work for grade and alignment to following tolerances:
  - 1. Top of forms not more than 1/8 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 often as required to ensure separation from concrete without damage.

### **3.4 CONCRETE PLACEMENT**

- A. General: Comply with requirements of NJ DOT Standard Specifications and ACI standards for mixing and placing concrete, and as herein specified.
- B. 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.
- C. Place concrete using methods which 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.
  - 1. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 2. 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.
- D. Curbs: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.
- E. Do not place concrete if inclement weather or freezing conditions are expected within the following 24 hours.

### **3.5 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. Expansion joints shall be placed in such a manner to ensure that slabs shall be allowed to expand in no less than 2 directions and slabs shall not exceed 8 feet in any single dimension.
- B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas measuring 4'x4', 5'x5', or 6'x6' as required subject to A2 above. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
1. **Tooled Joints:** Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
- C. Expansion Joints: Provide pre-molded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, fence posts, walls, walks and other fixed objects, unless otherwise indicated.
1. For 4" thick concrete, locate expansion joints at maximum 16 feet spacing, unless noted otherwise on the plans.
  2. For 6" thick concrete, locate expansion joints at 24 feet maximum spacing, unless otherwise indicated on the plans.
  3. Extend joint fillers full-width and depth of joint, and not less than 1/4 inch or more than 1/2 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
  4. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
  5. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
  6. Slabs adjoining building walls at doorways shall be doweled into the wall to prevent differential settling. See Architectural plans for typical doweled connection to building walls.

### **3.6 CONCRETE FINISHING**

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10 feet straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.
- 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 troweling when excess moisture or surface sheen has disappeared, complete surface finishing, 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 as reviewed by Architect or Engineer.

2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by the Engineer.

### **3.7 CURING**

- A. Protect and cure finished concrete paving. Use membrane- forming curing and sealing compound or Engineer's reviewed moist-curing methods. Keep concrete surfaces moist during curing period.

### **3.8 REPAIRS AND PROTECTIONS**

- A. Repair or replace broken, stained, misaligned, defective, or vandalized concrete, as directed by Engineer or Architect at no additional cost to the owner.
- B. Drill test cores where directed by Engineer, 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. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

END OF SECTION - 321313



## **SECTION 329113 - SOIL PREPARATION**

### **PART 1 – GENERAL**

#### **1.1 GENERAL REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
- B. Restoration of lawn areas disturbed by construction.

#### **1.2 WORK INCLUDED**

- A. Topsoil Screening & debris removal.
- B. pH adjusters.
- C. Soil Conditioners.
- D. Fertilizer.

#### **1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 01: Equipment & Materials
- C. Division 02: Selective Site Demolition
- D. Division 31: Earth Moving
- E. Division32: Lawns and Grasses.

#### **1.4 SUBMITTALS**

- A. Product Data: Manufacturer's technical literature with installation and storage instructions for each product specified.
- B. Samples: If requested by Architect / Engineer.
- C. Quality Control:
  - 1. Test Reports: Topsoil composition, in duplicate. Acid-producing deposits, in duplicate
  - 2. Certifications: In duplicate.

#### **1.5 QUALITY ASSURANCE**

- A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.
- B. Regulatory Agencies: Conform to applicable requirements of Local and State department of Architecture Extension service of the state in which the project is located.
- C. Contractor's certification that products installed conform with requirements specified.

D. Pre-Installation Conference:

1. Hold at time and place designated by Owner or Owner's Representative, and attended by representative of Architect, Contractor, landscaping trades and other trades whose work affects landscaping before starting work.
2. Discuss and finalize the following for record:
  - a. Review project drawings and specifications, including revisions, approved shop drawings and documented local landscaping practice; resolve conflicts, deviations or differences in local practice and project documents.
  - b. Review drawings for correct drainage, appropriate restoration locations shown, location and purity of water and verification of soil test results.
  - c. Time schedule and sequence of events proposed for installation.
  - d. Review limitations imposed by weather and special requirements of Contractor.
  - e. Establish storage and working areas of site available for use.
  - f. Clarify specifications, details, application/ installation, requirements what work should be completed before start of landscaping, and other items affecting installation and quality application of landscaping.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to job site in unopened containers bearing manufacturer's name and content identification.
- B. Store materials as recommended by the manufacturer.

**1.7 PROJECT CONDITIONS**

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.

**PART 2 - PRODUCTS**

**2.1 TOPSOIL**

- A. Existing Soil: Existing topsoil is present in all construction areas and shall be stripped and temporarily stockpiled in the general locations shown. Provide silt fence around stockpiles per the local jurisdiction and in accordance with current Soil Erosion & Sediment Control Plan requirements. Modify and screen existing topsoil to conform to composition requirements specified below as needed to provide minimum topsoil thicknesses suitable for new lawns and grasses.
- B. Off-Site Topsoil:
  1. The contractor may import offsite topsoil to the site, provided that it conforms to composition requirements specified below.
  2. Screened Topsoil: Furnished by Contractor
- C. Composition:
  1. Specific for lawns, grasses, trees, plants and ground covers specified and shown on the drawings. No organic matter or stone larger than one (1) inch in the topsoil is acceptable.
  2. Physical Analysis (Soil Texture):

Quantity Percent by Oven Dry Weight	Size Fraction	Range of Particle Diameter (Inches)
Less than 2%	gravel	Larger than 3/4
Less than 3%	gravel	1/4 to 3/4
Less than 10%	gravel	2/25 to 1/4
40% to 65%	sand	1/500 to 2/25
25% to 60%	silt	1/12,500 to 1/500
Less than 20%	clay	Smaller than 1/12,500

- a. Determine amounts of sand, soil and clay in the bail by hydrometer method or mechanical analysis. Size gravel by separation on screens with appropriate size openings.
  - b. Soil should be relatively free of undecomposed roots, sticks, leaves, paper and other organic material. Remove undesirable trash such as glass, plastic or metal fragments before seeding or planting.
3. Chemical Analysis:
- a. Organic matter content (% oven dry weight of soil):
    - 1) Sandy loam 1.25% to 20%.
    - 2) Loam and silt loam 2.5% to 20%.
    - 3) Soil with less than 10% organic matter use wet oxidation method of analysis.
    - 4) Soil with more than 10% organic matter use loss on ignition method of analysis.
  - b. Soil reaction: pH of 4.5 to 7.0.
  - c. Soluble salt content:
    - 1) Conductivity (Ece, millimhos per centimeter):  
 Less than 1.0 mmhos/cm for a 1:1 soil:water ratio.  
 Less than 0.5 mmhos/cm for a 1:2 soil:water ratio.  
 Less than 0.33 mmhos/cm for a 1:3 soil:water ratio.

## 2.2 PH ADJUSTERS

- A. Lime:
  1. Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates.
  2. Gradation: Minimum 50 percent passing 100-mesh sieve and 90 percent passing 10-mesh sieve.
- B. Aluminum Sulfate: Commercial grade.

## 2.3 SOIL CONDITIONERS

- A. General:
  1. Use singly or in combinations required to meet requirements for topsoil.
  2. Soil Conditioners: Nontoxic to plants. Acid-neutralization as required.
- B. Peat:

1. Peat humus derived from a freshwater site and conforming to ASTM D 2607 as modified herein.
  2. Shred and granulate peat to pass ½-inch mesh screen and condition in storage pile for minimum six months after excavation.
- C. Sand: Clean and free of toxic materials.
- D. Perlite: Horticultural grade for planters.
- E. Vermiculite: Horticultural grade for planters, free of toxic substances.
- F. Rotted Manure:
1. Wall rotter horses or cattle manure containing maximum 25 percent by volume of straw, sawdust, or other bedding materials; free of stones, sticks and soil and containing no chemicals or ingredients harmful to plants.

#### **2.4 FERTILIZER**

- A. Commercial Grade fertilizer:
1. Complete, neutral character, with elements derived from organic sources, containing the following percentages of available plant nutrients:
    - a. Lawns: For each 100 square feet of area provide fertilizer with a minimum of 1 lb. actual nitrogen with a minimum of 50 percent in organic form, 4 percent phosphoric acid, and 2 percent potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth.
    - b. Trees and Shrubs: Provide fertilizer with not less than 5 percent total nitrogen, 10 percent available phosphoric acid and 5 percent soluble potash.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas in which Work is to be performed. Report in writing to Owner and Engineer all prevailing conditions that will adversely affect satisfactory execution of Work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting Work constitutes acceptance of the existing conditions and this Contractor shall then, at his expense, be responsible for correcting all unsatisfactory and defective Work encountered.
- C. Examine existing topsoil found at the project site for suitable for re-use as specified herein. Determine if existing topsoil satisfies topsoil requirements as defined herein and/or if they can be modified to comply. Supplement with additional topsoil as needed to restore all disturbed areas to lawns and grasses to an acceptable condition as determined by the Architect / Engineer.

#### **3.2 PREPARATION**

- A. Subgrade:
1. After areas required to be restored as lawn or landscaped have been brought to required subgrade, thoroughly till to minimum depth of 8 inches by scarifying, disking, harrowing, or other approved methods.

2. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage.

### **3.3 TOPSOILING**

- A. Immediately prior to placing topsoil, prepare entire planting areas shown on drawings, scarify subgrade to a 8 inch depth for bonding of topsoil with subsoil.
- B. Lawns: Spread screened topsoil evenly to a minimum depth of 5-6 inches. Do not spread topsoil when frozen or excessively wet or dry.
- C. Correct irregularities in finished surfaces to eliminate depressions.
- D. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.
- E. Topsoil shall be free of debris and any stone larger than 1 inch in dimension and said composition shall be as defined herein.

### **3.4 pH ADJUSTERS, SOIL CONDITIONERS AND FERTILIZER**

- A. Application: Apply fertilizer and soil conditioners in accordance with the Permanent Seeding Specification on the Soil Erosion and Sediment Control Plan.
- B. Adjust pH level in topsoil and subgrade soils as discussed in related earthwork sections. Dispose of acid soils off-site in a legal manner.

END OF SECTION - 0329113

## **SECTION 329200 - LAWNS & GRASSES**

### **PART 1 - GENERAL**

#### **1.1 GENERAL REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
- B. Temporary and permanent stabilization, as specified in this section, shall be carried out in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey.

#### **1.2 WORK INCLUDED**

- A. Seed.
- B. Mulches.
- C. Asphalt Adhesive.
- D. Water.
- E. Subgrade Elevations: Excavation, filling and grading required to establish elevations shown on Drawings are not specified in this section.
- F. The task items specified in A through D above must be applied to all disturbed areas, whether or not indicated on the drawings. Include adjacent property wherever grass is disturbed in execution of this contract.

#### **1.3 RELATED SECTIONS**

- A. Division 01: Submittals
- B. Division 01: Equipment & Materials
- C. Division 31: Earth Moving
- D. Division 32: Soil Preparation.

#### **1.4 SUBMITTALS**

- A. Product Data: Manufacturer's technical literature with installation and storage instructions for each product specified.
- B. Delivery Schedule: Ten working days prior to installation.
- C. Samples: If requested by Architect/Engineer.
- D. Quality Control:
  - 1. Certifications: In duplicate.

2. Certificates of inspection required by regulatory agencies. Data substantiating that materials comply with requirements specified.
3. Seed supplier's certification for each grass seed species mixture specified, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed.

E. Contract Closeout:

1. Maintenance schedule: In duplicate.

**1.5 QUALITY ASSURANCE**

- A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.
- B. Regulatory Agencies: Conform to applicable requirements of Local and State agencies and boards.
- C. Landscape Work: Executed by a single firm with a minimum of five year's experience specializing in landscape work, and can demonstrate successful completion of comparable work in region in which this project is located.
- D. Shipping: Ship landscape materials with certificates of inspection required by regulatory agencies. Comply with regulations applicable to landscape materials.
- E. Non-availability: If specified landscape material is not obtainable, submit proof of non-availability to Architect, together with proposal for use of equivalent material.
- F. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.
- G. Pre-Installation Conference:
  1. Hold at time and place designated by Architect or Engineer and attended by representatives of Owner, Contractor, landscaping trades and other trades whose work affects landscaping before starting work.
  2. Discuss and finalize the following for record:
    - a. Review project Drawings and specifications, including revisions, approved shop Drawings and documented local landscaping practice; resolve conflicts, deviations or differences in local practice and project documents.
    - b. Review drawings for correct drainage, appropriate plants for locations shown, location and purity of water and verification of soil test results.
    - c. Time schedule and sequence of events proposed for installation.
    - d. Review limitations imposed by weather and special requirements of Contractor.
    - e. Establish storage and working areas of site available for use.
    - f. Clarify specifications, details, applications/installation requirements, what work should be completed before start of landscaping, and other items affecting installation and quality application of landscaping.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Packaged Materials: Deliver packaged materials in unopened watertight containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site as recommended by manufacturer.

**1.7 PROJECT CONDITIONS**

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.
- B. Proceed with and complete work of this section as rapidly as portions of site become available, working within planting date limitations for work specified.
- C. Correlate planting with specified maintenance periods to provide maintenance from date of Substantial Completion.

**1.8 WARRANTY**

- A. Warranty lawns and grasses unconditionally for one full growing season beginning from date of final acceptance.
- B. Beginning from the date of final acceptance, all lawns and grasses shall be alive and in satisfactory growth at end of warranty period.
- C. Replace any material that is diseased or 25% dead or more at no cost to the Owner.

**1.9 MAINTENANCE**

- A. Provide typewritten or printed maintenance instructions for one full growing cycle.
- B. Maintenance Instructions Include:
  - 1. Rate and frequency of irrigation.
  - 2. Pesticide, fertilizer and herbicide application schedules.
  - 3. Optimum mowing height.

**PART 2 - PRODUCTS**

**2.1 SEED**

- A. Classification:
  - 1. Grass seed: Fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed mixture composed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, specified.
  - 2. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.
  - 3. Label containers carrying seed in conformance with state seed laws.
- B. Seed Mixture: In accordance with industry standards and the Soil Erosion and Sediment Control Plan requirements where the project is located.



C. Provide seeds and mixtures as indicated in Table 0329200-1 located at the end of this Section.

## **2.2 MULCHES**

- A. General: Free from noxious weeds, mold, and other deleterious materials.
- B. Threshed Straw: Seed free threshed straw stalks from oats, wheat, rye or barley. Air-dry condition of proper consistency for placing with commercial mulch blowing equipment.
- C. Salt hay: Use only seed free salt hay for lawn areas. Air-dry condition of proper consistency for placing with commercial mulch blowing equipment.

## **2.3 ASPHALT ADHESIVE**

- A. ASTM D977, Grade rS-1. Use with straw or salt hay mulch.

## **2.4 WATER**

- A. Suitable quality for irrigation.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas in which Work is to be performed. Report in writing to owner and engineer all prevailing conditions that will adversely affect satisfactory execution of Work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting Work constitutes acceptance of the existing conditions and Contractor shall then, at his expense, be responsible for correcting all unsatisfactory and defective Work encountered.

### **3.2 PLANTING CONDITIONS AND TIME RESTRICTIONS**

- A. Planting Dates: In accordance with industry standards and the Soil Erosion and Sediment Control Plan requirements where the project is located.
- B. Restrictions: Do not plant when ground is frozen, snow covered, or muddy.

### **3.3 PREPARATION FOR PLANTING LAWNS**

- A. Loosen subgrade of lawn areas to a minimum depth of 8 inches. Remove stones over 1 inch in dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which can be plated promptly after preparation.
- B. Place approximately ½ of total amount of screened topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil to meet lines, grades and elevations shown, after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 4 inches of topsoil.
- C. Provide Lime and Fertilizer in accordance with industry standards and the Soil Erosion and Sediment Control Plan requirements where the project is located.

- D. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be plated immediately after grading.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before plating lawns. Do not create a muddy soil condition.
- F. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

### **3.4 SEEDING**

- A. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 miles per hr. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
- B. Seeding Rate: In accordance with industry standards and the Soil Erosion and Sediment Control Plan requirements where the project is located.
- C. Rake seed lighting into top 1/8 inch of soil, roll lightly, and water with a fine spray.
- D. Protect seeded slopes against erosion with erosion control material.
- E. Protect seeded areas against erosion with mulch after completion of seeding operations. Spread mulch uniformly to form a continuous blanket not less than 1-1/2 inches loose measurement over seeded areas.
  - 1. Anchor mulch by crimping with serrated disc, or by spraying with asphalt emulsion. Take precautions to prevent damage or staining of structures, pavements, utilities or other plantings adjacent to mulched areas.
- F. Rolling:
  - 1. Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width.
  - 2. If seeding is performed with cultipacker-type seeder or Hydro seeding, rolling may be eliminated.
- G. Watering: Start immediately after completing each day's sodding. Apply at a rate sufficient to ensure thorough wetting of soil to minimum depth of 4 inches.

### **3.5 PROTECTION OF LAWN AND GRASS AREAS**

- A. Immediately after seeding, protect the area against traffic or other use.

### **3.6 RESTORATION**

- A. Recondition existing lawn areas damaged by Contractor's operations including storage of materials and equipment, movement of vehicles, or where minor regrading is required.
  - 1. Provide fertilizer soil amendments and seed or sod specified for new lawns and grasses as required to provide a satisfactorily reconditioned lawn. Provide new topsoil to fill low spots and meet new finish grades.
  - 2. Cultivate bare and compacted areas thoroughly to provide a satisfactory, planting bed.

3. Remove diseased and unsatisfactory lawn areas; do not bury in cultivated soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil dripping, stone, gravel and other building materials.
  4. Where substantial lawn remains:
    - a. Remove weeds before seeding, if extensive, apply EPA approved selective chemical weed killer.
    - b. Compacted, fill low spots, remove humps and cultivate soil, fertilize, and seed.
    - c. Apply a seedbed mulch, if required, to maintain moist condition.
- B. Water newly planted areas and keep moist with daily watering schedule until new grass is established.

### **3.7 ESTABLISHMENT PERIOD**

A. Definitions:

1. Lawns and grasses establishment period will be in effect until lawns and grasses have been mowed three times, and
2. Stand of lawn and grass is 95 percent ground cover of established species.

B. Maintenance During Establishment Period:

1. Begin maintenance immediately after planting.
2. Maintain lawns for not less than the following periods, and longer as required to establish an acceptable lawn.
  - a. Seeded lawns: Not less than 60 days after Substantial Completion.
  - b. If seeded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.
3. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading and replanting as required to establish a smooth lawn acceptable to the Engineer, free of eroded or bare areas.
4. Mow lawns and grassed areas to an average height of 2 inches whenever average height of grass becomes 3 inches.
5. Promotion of Growth: Mow, remove excess clippings, eradicate weeds, water, fertilize, overseed, and perform other operations necessary to promote growth.
6. Post-fertilize areas with commercial grade fertilizer approximately 7 days after planting and at intervals of 2 weeks thereafter until accepted. Apply fertilizer uniformly in accordance with industry standards and the Soil Erosion and Sediment Control Plan requirements where the project is located.

### **3.8 CLEANUP AND PROTECTION**

- A. During landscape work, keep pavements clean and work area in an orderly condition.
- B. Protect landscape materials, and work from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed by the Architect / Engineer.

### **3.9 FINAL ACCEPTANCE**

A. Final Inspection and Acceptance:

1. Final inspection will be made upon written request from the Contractor at least 10 days prior to last day of lawn and grasses establishment period.

- 2. Final acceptance will be based upon a satisfactory stand of lawns and grasses as defined in the paragraph entitled, "Establishment Period."
- B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected and accepted by Engineer. Contractor shall remove rejected plants and materials promptly from project site.
- C. Replanting: Re-seed or Re-sod areas which do not have a satisfactory stand of lawns and grasses.

<i>Table 0329200-1 Formula B</i>					
<i>(Seed Mix #1 – Maintained Areas)</i>					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
<i>Perennial Ryegrass Mixture (Lolium perenne). A combination of improved certified varieties with no one variety exceeding 50% of the total Ryegrass component.</i>	20	98	90	0.15	4.0
<i>Creeping Red Fescue or Chewings Fescue</i>	30	98	85	0.15	6.0
<i>Kentucky Bluegrass Mixture (Poa pratensis). A combination of improved certified varieties with no one variety exceeding 25% of the total Bluegrass component.</i>	50	98	80	.20	11.0
					<i>21.0 Total</i>

END OF SECTION - 329200

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ELECTRICAL

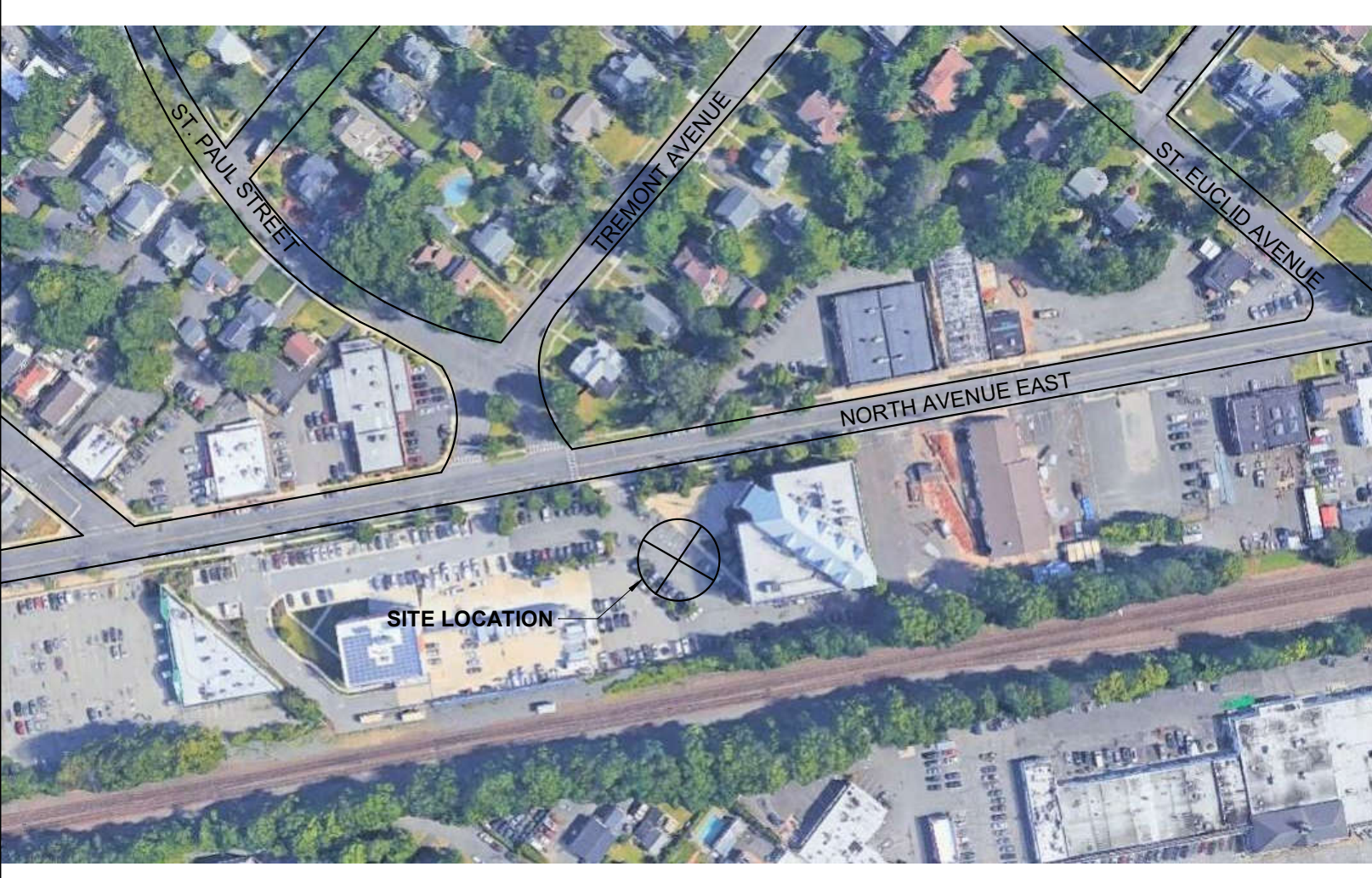
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ARCHITECT & ENGINEERS

**PAULUS SOKOLOWSKI AND SARTOR ENGINEERING, PC**

67A MOUNTAIN BLVD. EXTENSION  
WARREN, NEW JERSEY 07059  
732-560-9700  
WWW.PSANDS.COM

LOCATION MAP



CODE DATA

ALL WORK SHALL COMPLY WITH ALL GOVERNING CODES, REGULATIONS AND ORDINANCES, ETC. COMPLIANCE WITH THE FOLLOWING STANDARDS (MOST RECENT VERSION) IS REQUIRED:  
 NJAC 5:23 NEW JERSEY UNIFORM CONSTRUCTION CODE  
 NJAC 5:23-6 REHAB SUBCODE: J-23-6 RENOVATIONS  
 IBC 2018 NJ EDITION  
 NEC 2017  
 NSPC 2018  
 IMC 2018  
 IFGC 2018  
 ANSI A117.1-2009  
 AHSRAE 90.1-2016

NOTE: THE SCOPE OF WORK FOR THIS PROJECT INCLUDES PROTECTION AND RESTORATION OF ALL EXISTING ITEMS EFFECTED BY CONSTRUCTION, INCLUDING PRODUCTS, MATERIALS, FINISHES AND SITE AREA EFFECTED BY THE WORK OF THIS CONTRACT.

PROJECT DATA

PROJECT DESCRIPTION: FROEHLICH BUILDING RENOVATION OF EXISTING FIRST FLOOR POLICE COMMAND CENTER (DISPATCH AREA) AND EXPANSION INTO EXISTING OFFICE AND GARAGE BAY AREAS. EXISTING GARAGE BAYS ARE (S-1 USE). THIS WILL REQUIRE A CHANGE OF USE TO B - BUSINESS USE FROM S-1 STORAGE USE. PROGRAM REMOVED FROM FROEHLICH BUILDING WILL BE RELOCATED TO THE VEHICLE STORAGE BUILDING AND REQUIRE VISUAL SEPARATION.

PROJECT LOCATION: WESTFIELD, NEW JERSEY

	FROEHLICH BUILDING	VEHICLE STORAGE BUILDING
OCCUPANCY CLASSIFICATION:	B BUSINESS / S-1 STORAGE	B BUSINESS / A-3 ASSEMBLY / S-2 STORAGE
TOTAL GROSS AREA:	51,209 SF	22,090 SF
AREA OF WORK:		
FIRST FLOOR		
PHASE 1		
RECONSTRUCTION	2,627 SF	0 SF
ALTERATION	0 SF	950 SF
CHANGE OF USE	3,122 SF	0 SF
PHASE 2		
RECONSTRUCTION	1,200 SF	0 SF
REPAIR	1,000 SF	0 SF
TOTAL	7,949 SF	950 SF
FIRE PROTECTION:	FULLY SPRINKLERED	FULLY SPRINKLERED
CONSTRUCTION TYPE:	IIB NON COMBUSTIBLE	IIB NON COMBUSTIBLE
EXISTING BUILDING HEIGHT:	70' - 0"	44' - 4"
NUMBER OF STORIES:	2 STORIES AND A PENTHOUSE	3 STORIES WITH PARKING DECK

County of Union

# UNION COUNTY DISPATCH CENTER EXPANSION



## Board of Chosen Commissioners

Joseph A. Graziano, Sr., CPWM,  
Department of Engineering, Public  
Works and Facilities Management

Andrew Moran, Director,  
Department of Public Safety

Thomas O. Mineo P.E.,  
County Engineer, Division  
of Engineering

## FROEHLICH BUILDING NORTH AVENUE WESTFIELD, NEW JERSEY



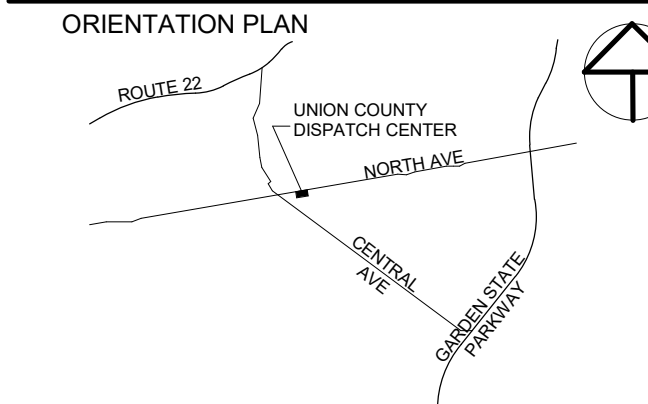
03/17/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION

03/17/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION

ISS / REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1
2	03/17/21	ISSUED FOR BID REV2

CLIENT

CONSULTANT



PAULUS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
 P.O. Box 4059  
 WARREN, NEW JERSEY 07059  
 TEL: 732.560.9700

ALL DIMENSIONS MUST BE DERIVED BY THE CONTRACTOR NOTY PAULUS SOKOLOWSKI AND SARTOR ENGINEERING, PC OF ANY CONFLICTS, ERRORS, OMISSIONS OR DISCREPANCIES IN THE CONTRACT DOCUMENTS OR SPECIFICATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING DIMENSIONS. ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DOCUMENTS. DO NOT SCALE THE DRAWINGS TO DETERMINE DIMENSIONS. THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE PROJECT AND CANNOT BE USED FOR ANY OTHER PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING DIMENSIONS OF THE PROJECT OR FOR RESOLVE ANY OTHER PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING DIMENSIONS OF THE PROJECT OR FOR RESOLVE ANY OTHER PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING DIMENSIONS OF THE PROJECT OR FOR RESOLVE ANY OTHER PROJECT.

Harry T. Osborne  
Registered Architect - New York  
License no. 021300

SIGNATURE DATE

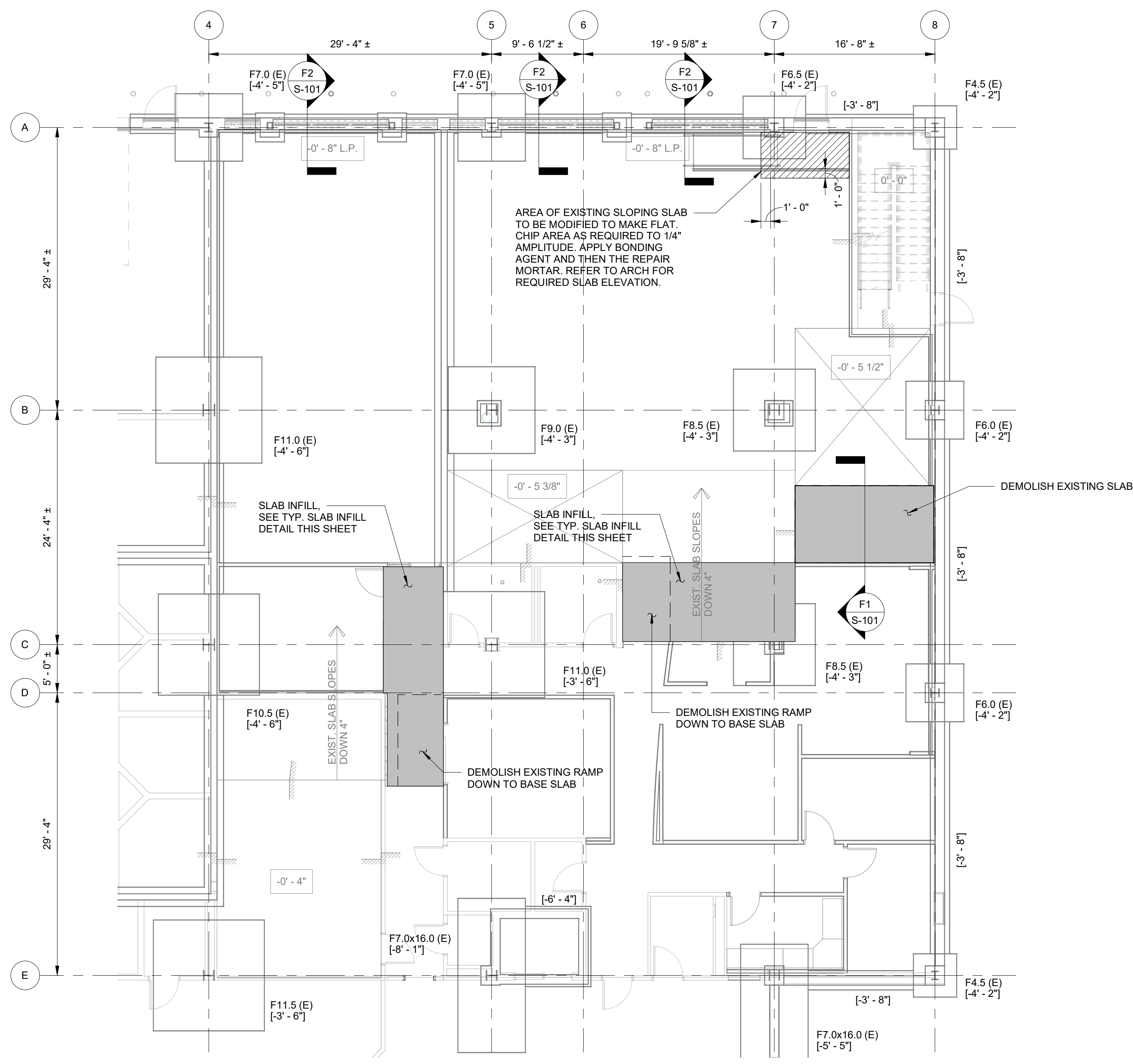
CLIENT  
County of Union

PROJECT  
UNION COUNTY DISPATCH CENTER EXPANSION  
FROEHLICH BUILDING NORTH AVENUE WESTFIELD, NEW JERSEY  
SHEET NAME  
TITLE SHEET

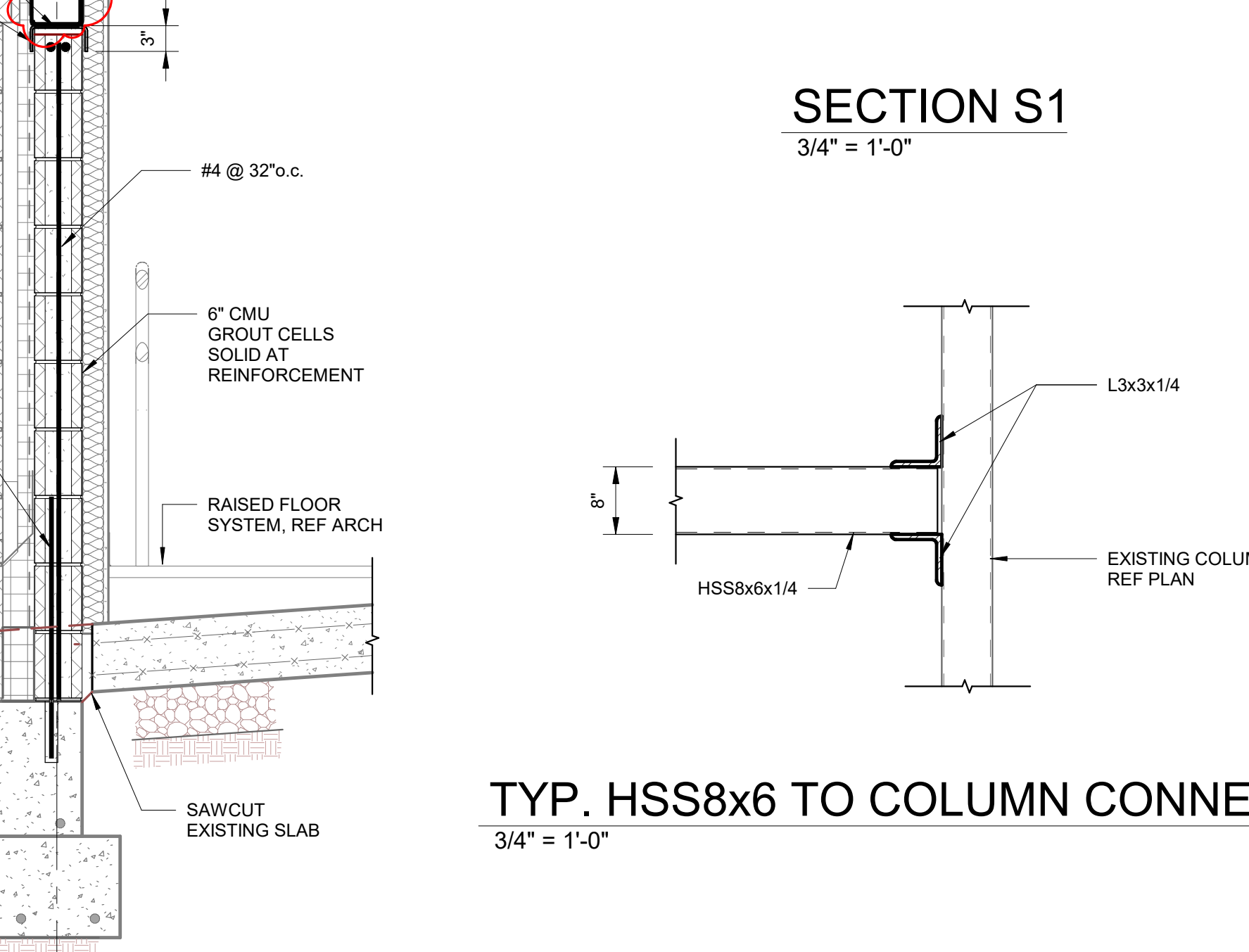
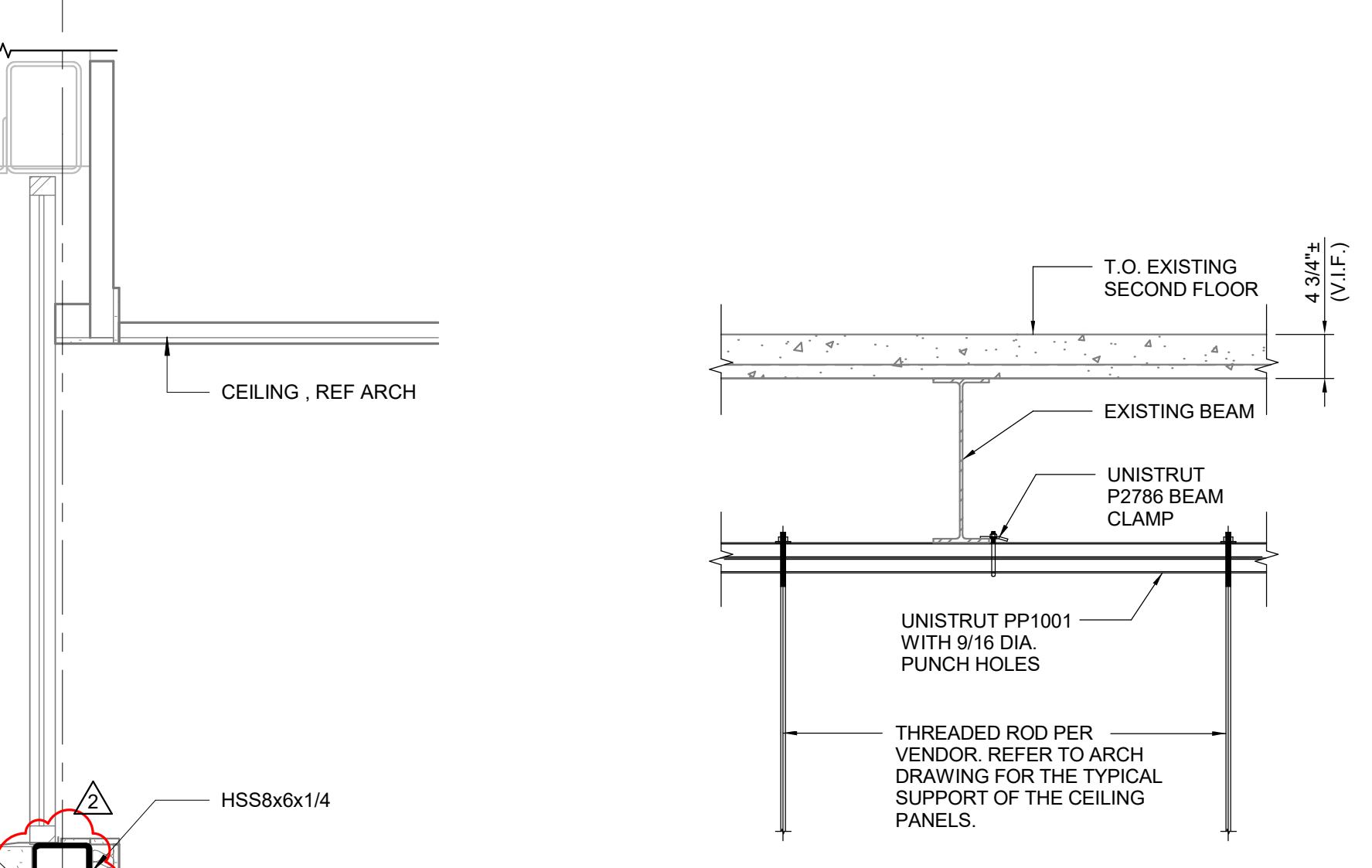
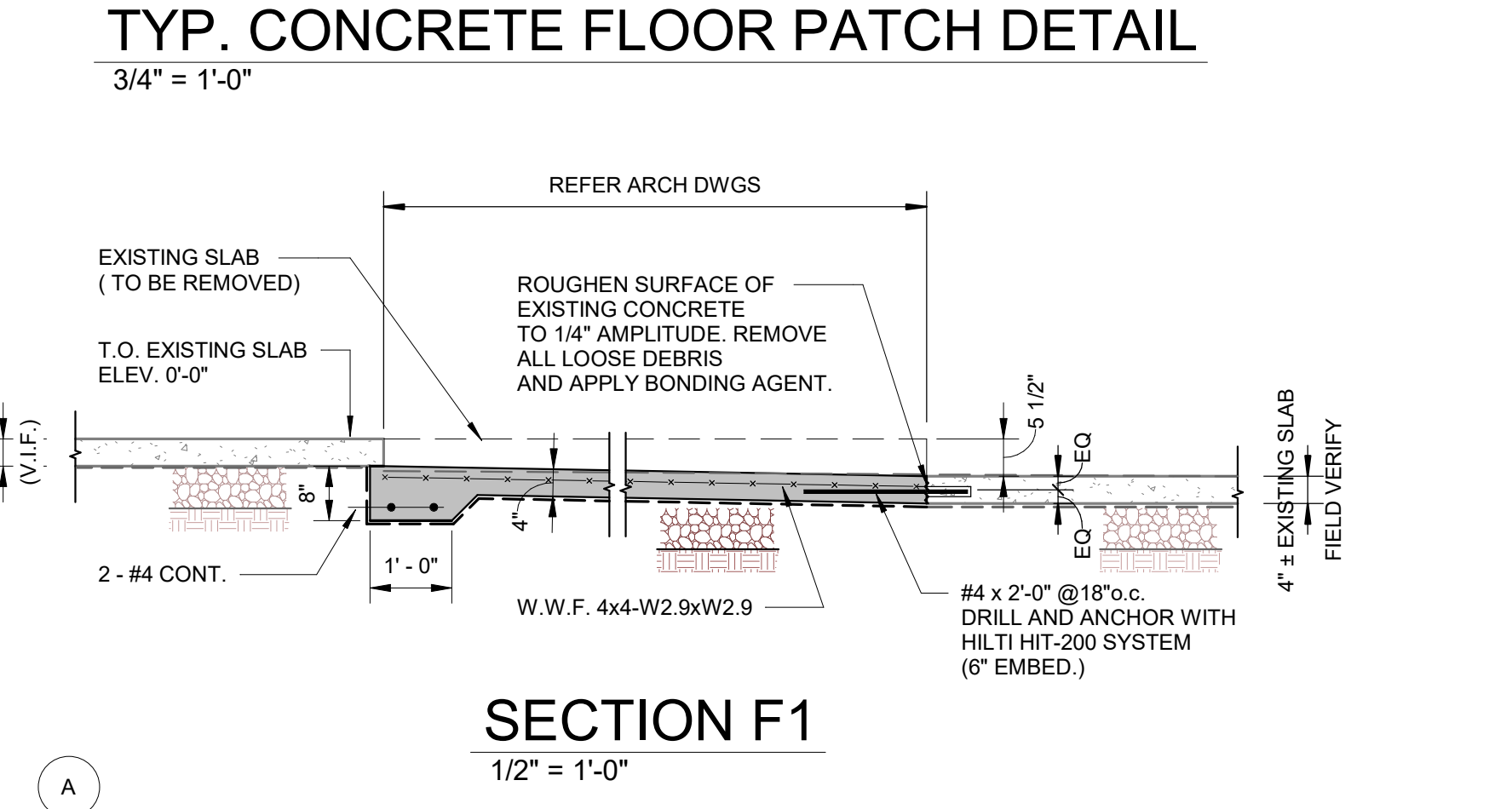
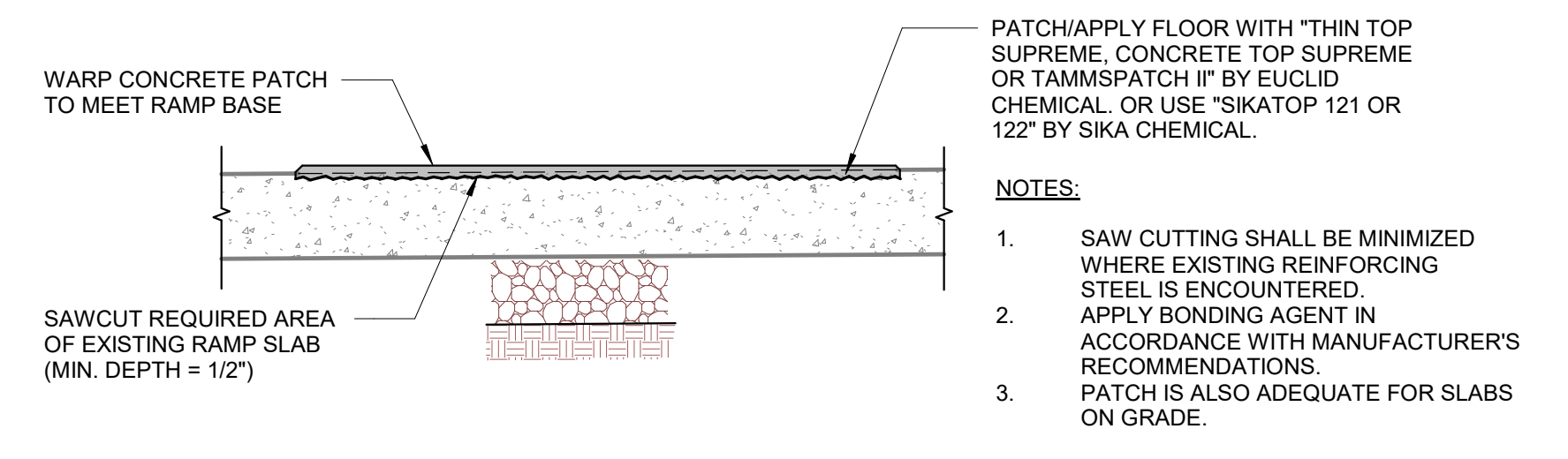
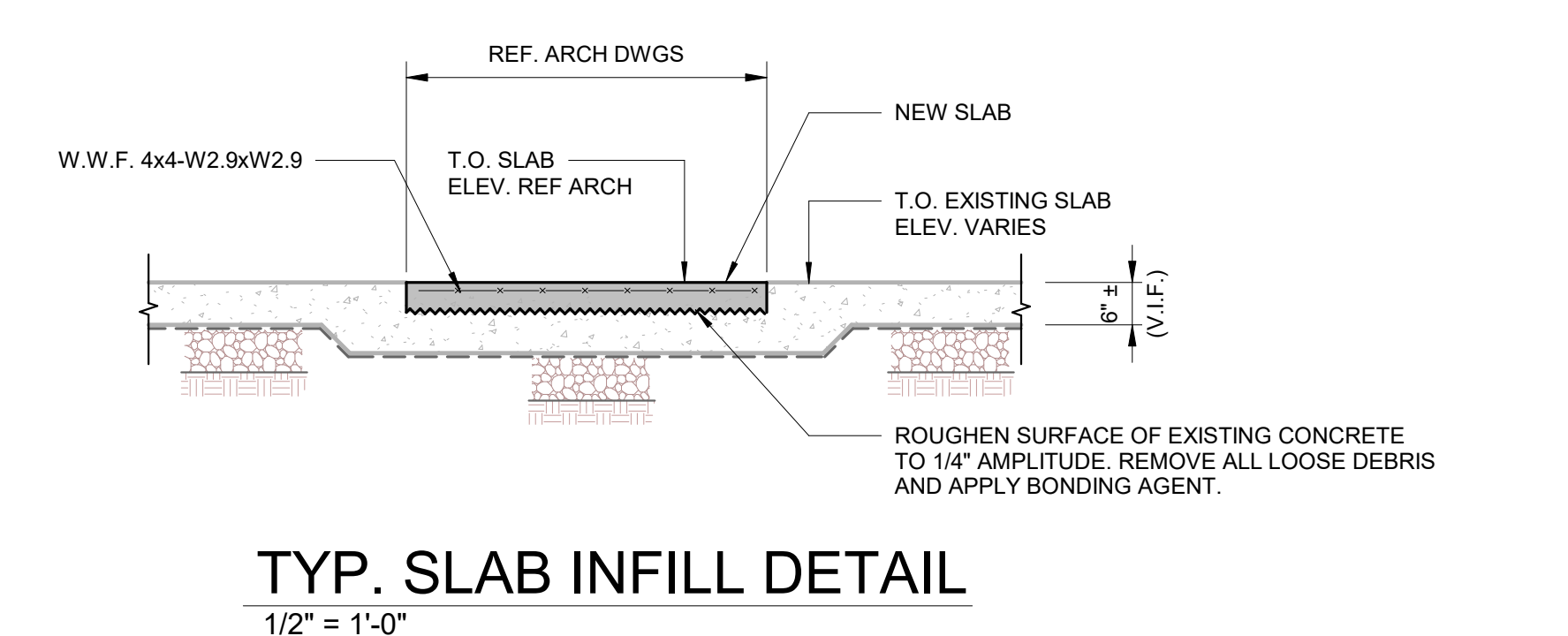
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DATE: 04/28/2020  
DRAWN: MNY  
CHECK: JMG  
SCALE:  
SHEET NO.

G-001





**1 FIRST FLOOR CONSTRUCTION FLOOR PLAN - PHASE 1**  
1/8" = 1'-0"



**SECTION F2**  
3/4" = 1'-0"

SI	SPECIAL INSPECTIONS
SI-1	THE FOLLOWING STRUCTURAL ITEMS REQUIRE SPECIAL TESTING AND/OR INSPECTIONS
	STRUCTURAL STEEL WELDING ERECTION & BOLTING
	CONCRETE WORK

**STRUCTURAL NOTES**  
**GENERAL**

- CONTRACTOR IS RESPONSIBLE FOR AND SHALL VERIFY AND COORDINATE ALL DIMENSIONS, DETAILS, AND EXISTING CONDITIONS BEFORE PROCEEDING WITH WORK. ANY DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT.
- DETAILS SHOWN IN ANY SECTION APPLY TO ALL SIMILAR SECTIONS UNLESS OTHERWISE NOTED.
- CONTRACTOR SHALL FULLY BRACE AND OTHERWISE PROTECT ALL WORK IN PROGRESS UNTIL THE STRUCTURAL BUILDING CODE IS COMPLETED.
- ALL STRUCTURAL ITEMS FOR THIS PROJECT HAVE BEEN DESIGNED IN ACCORDANCE WITH APPROPRIATE PROVISIONS OF EACH OF THE FOLLOWING:
  - THE INTERNATIONAL BUILDING CODE 2015, NEW JERSEY EDITION.
  - THE A.I.S.C. "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS", AISC 360-16.
  - A.C.I. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE", ACI 318-14.
- THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE SPECIFICATIONS AND THE ARCHITECTURAL AND MECHANICAL DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE ARCHITECT PRIOR TO REFORMING.
- MECHANICAL OPENINGS SHALL BE COORDINATED BY CONTRACTOR WITH MECHANICAL ENGINEER. FINAL SIZES AND LOCATIONS TO BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR APPROVAL.
- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR CONCRETE AND MASONRY.
- THE CONTRACTOR SHALL ENGAGE AN INDEPENDENT TESTING AND INSPECTION AGENCY ACCEPTABLE TO THE ENGINEER TO INSPECT AND TEST CONCRETE QUALITY. CONTRACTORS SHALL COORDINATE INSPECTIONS REQUIRED FOR THIS AGENCY.

**CONCRETE**

- ALL CONCRETE WORK SHALL CONFORM TO THE A.C.I. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" (ACI 318-05).
- SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- ALL CONCRETE SHALL HAVE MINIMUM 28-DAY COMPRESSIVE STRENGTHS AS INDICATED BELOW:

CONCRETE STRENGTH	TYPE AGGREGATE	AIR CONTENT	WHERE USED
4500 PSI	STONE	5 - 7%	SLAB ON GRADE

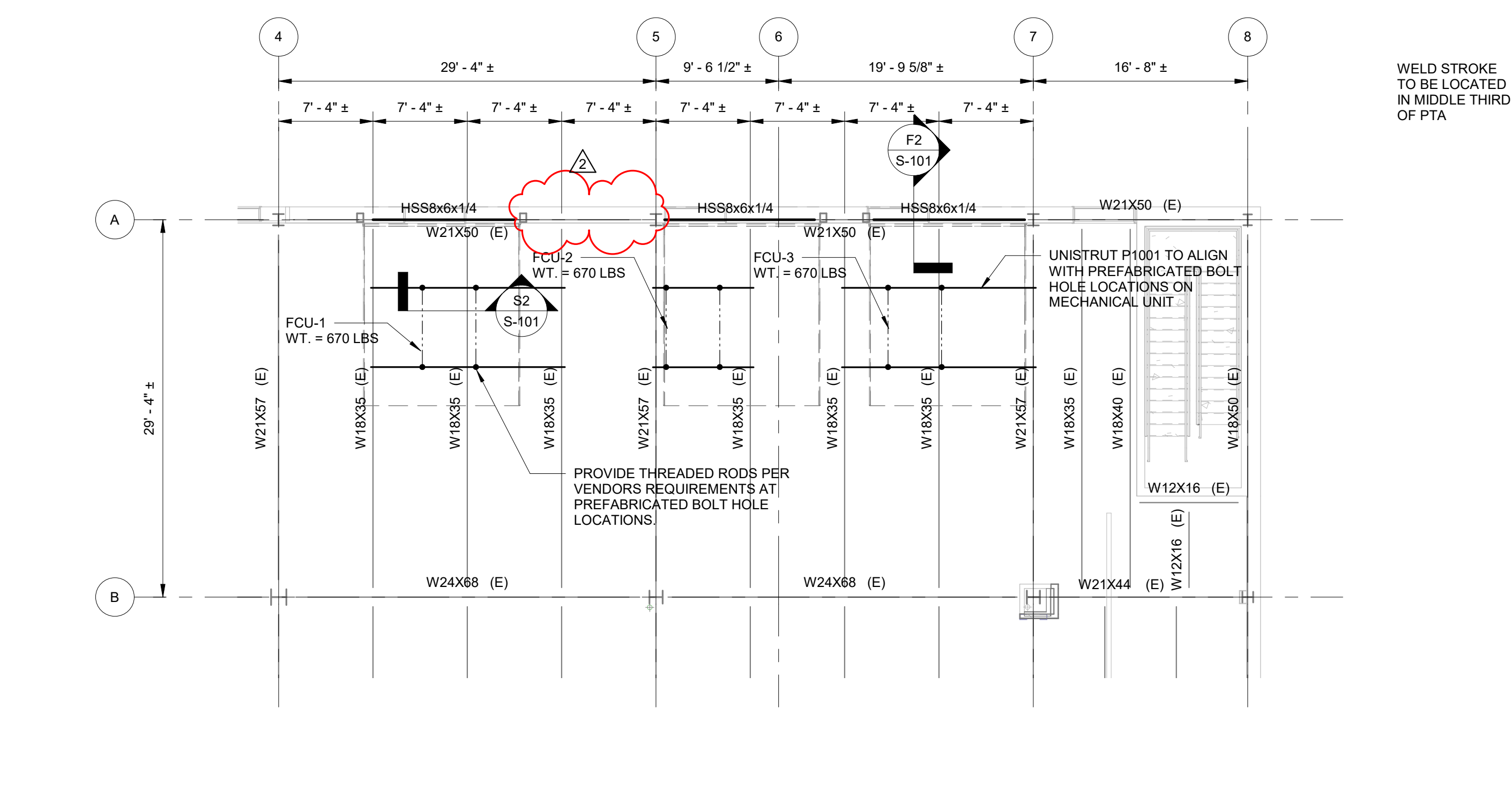
- PORTLAND CEMENT SHALL BE ASTM C150, TYPE II.
- ALL AGGREGATE SHALL CONFORM TO ASTM C33 FOR NORMAL WEIGHT AGGREGATES.
- ALL CONCRETE TO CONTAIN A WATER-REDUCING ADMIXTURE, ASTM C494, TYPE A, AND CONTAINING NOT MORE THAN .05 PERCENT CHLORIDE IONS (EUCCO HW-75, EUCLID COMPANY OR EQUAL).
- ALL CONCRETE MAY CONTAIN A HIGH RANGE WATER REDUCING ADMIXTURE (SUPERPLASTICIZER) ASTM C494, TYPE F OR TYPE G AND CONTAINING NOT MORE THAN .05 PERCENT CHLORIDE IONS (EUCCO-37, EUCLID COMPANY OR EQUAL).
- CONCRETE MIX DESIGN SHALL CONFORM TO ALL REQUIREMENTS OF ACI 318-05, CHAPTER 5.
- SLUMPS OVER 4 INCHES WILL NOT BE PERMITTED UNLESS THE HRWR ADMIXTURE (SUPERPLASTICIZER) IS USED. MAXIMUM SLUMP IS THEN 2\"/>

**STRUCTURAL STEEL**

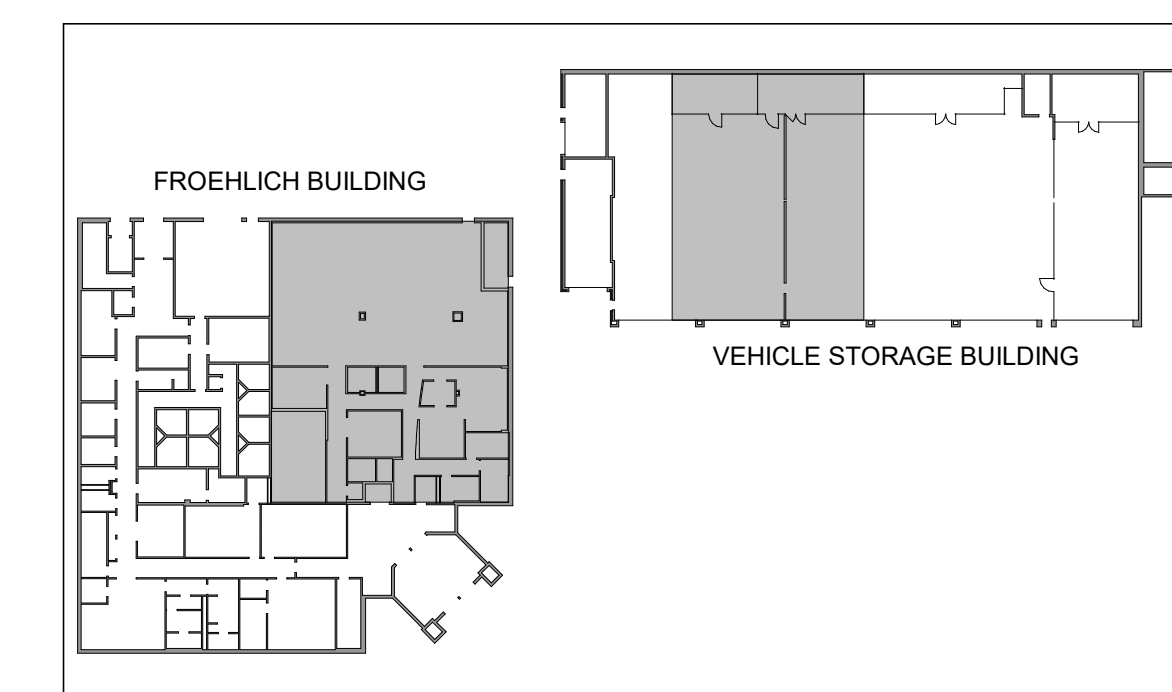
- ALL STRUCTURAL STEEL WORK SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST AISC CODE OF STANDARD PRACTICE. STRUCTURAL STEEL SHALL BE NEW, CLEAN, AND STRAIGHT, AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
  - PLATES, ANGLES, BARS, CHANNELS, AND S SHAPES: ASTM A36 (Fy=36 KSI).
  - SQUARE HSS: ASTM A500, GRADE B (Fy=46 KSI).
- ANY SUBSTITUTION MADE IN STEEL FRAMING SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL.
- SHOP CONNECTIONS MAY BE WELDED OR HIGH STRENGTH BOLTED. ALL CONNECTIONS SHALL CONFORM TO THE TYPICAL CONNECTION DETAILS SHOWN ON THE DRAWINGS.
- ALL WELDING SHALL CONFORM TO THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE - STEEL (AWS D1.1) AND SHALL BE DONE BY A W.S. QUALIFIED WELDER USING E70XX ELECTRODES.
- ALL CONTACT SURFACES WITHIN HIGH STRENGTH BOLTED CONNECTIONS, SLIP CRITICAL TYPE, AND WELDING AREAS SHALL BE FREE OF OIL, PAINT, AND LAQUER.
- ALL COLUMNS SHALL BE MILLED TO BEAR ON BASE PLATES.
- BURNING OF HOLES, CUTS, ETC., IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED, EXCEPT WITH THE SPECIFIC WRITTEN APPROVAL BY THE ENGINEER.

**MASONRY**

- DESIGN AND CONSTRUCTION SHALL CONFORM TO THE (TMS 402-13/ACI 530-13/ASCE5-13 AND TMS 602-13/ACI308-13/ASCE6-13) BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES.
- ALL MASONRY LOAD BEARING WALLS SHALL BE CONSTRUCTED OF HOLLOW LOAD BEARING UNITS CONFORMING TO ASTM C90 AND THE QUALITY ASSURANCE STANDARD, LEVEL B.
- USE TYPE "S" MORTAR FOR SETTING MASONRY UNITS.
- ALL MASONRY WALLS TO BE BUILT RUNNING BOND. FULL BED MORTAR FIRST COURSE WITH FACE SHELL BEDDING IN ALL OTHERS. PLASTER SHALL BE BUILT INTEGRAL WITH WALL IN RUNNING BOND. IN ALL MASONRY WALLS, PROVIDE TRUSS-LADDER TYPE HORIZONTAL JOINT REINFORCEMENT AT 8\"/>



**2 EXISTING SECOND FLOOR FRAMING PART PLAN**  
1/8" = 1'-0"

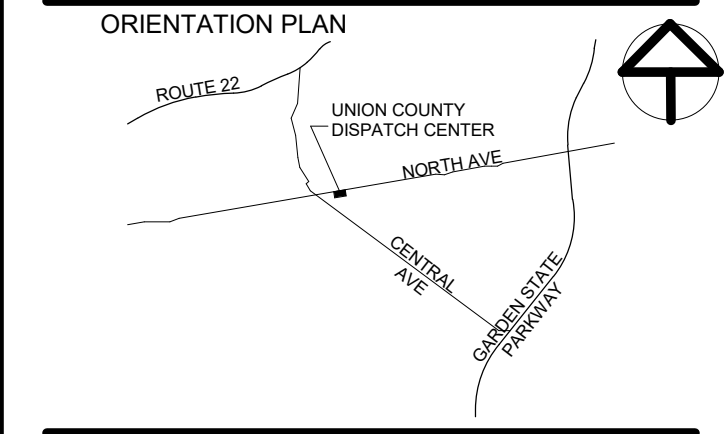


**KEY PLAN**

ISS/REV	DATE	ISSUE DESCRIPTION
0	03/08/21	ISSUED FOR BID REV 1
2	03/17/21	ISSUED FOR BID REV2

CLIENT

CONSULTANT



PALLUS SOKOLOWSKI and SARTOR ENGINEERING, PC  
67A MOUNTAIN BOULEVARD EXTENSION  
P.O. Box 4059  
WARREN, NEW JERSEY 07059  
TEL: 732.560.9700

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**Glenn P. Kustera**  
Professional Engineer, New Jersey  
License No. 42185

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

**Union County Div of Engineering**

PROJECT  
**UNION COUNTY DISPATCH CENTER AREA EXPANSION**

FROELICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME  
**MAIN BUILDING - PHASE 1**

JOB NO.: 03009002  
DATE: Issue Date  
DRAWN: RD  
CHECK: AR  
SCALE: As Indicated  
SHEET NO.

**S-101**



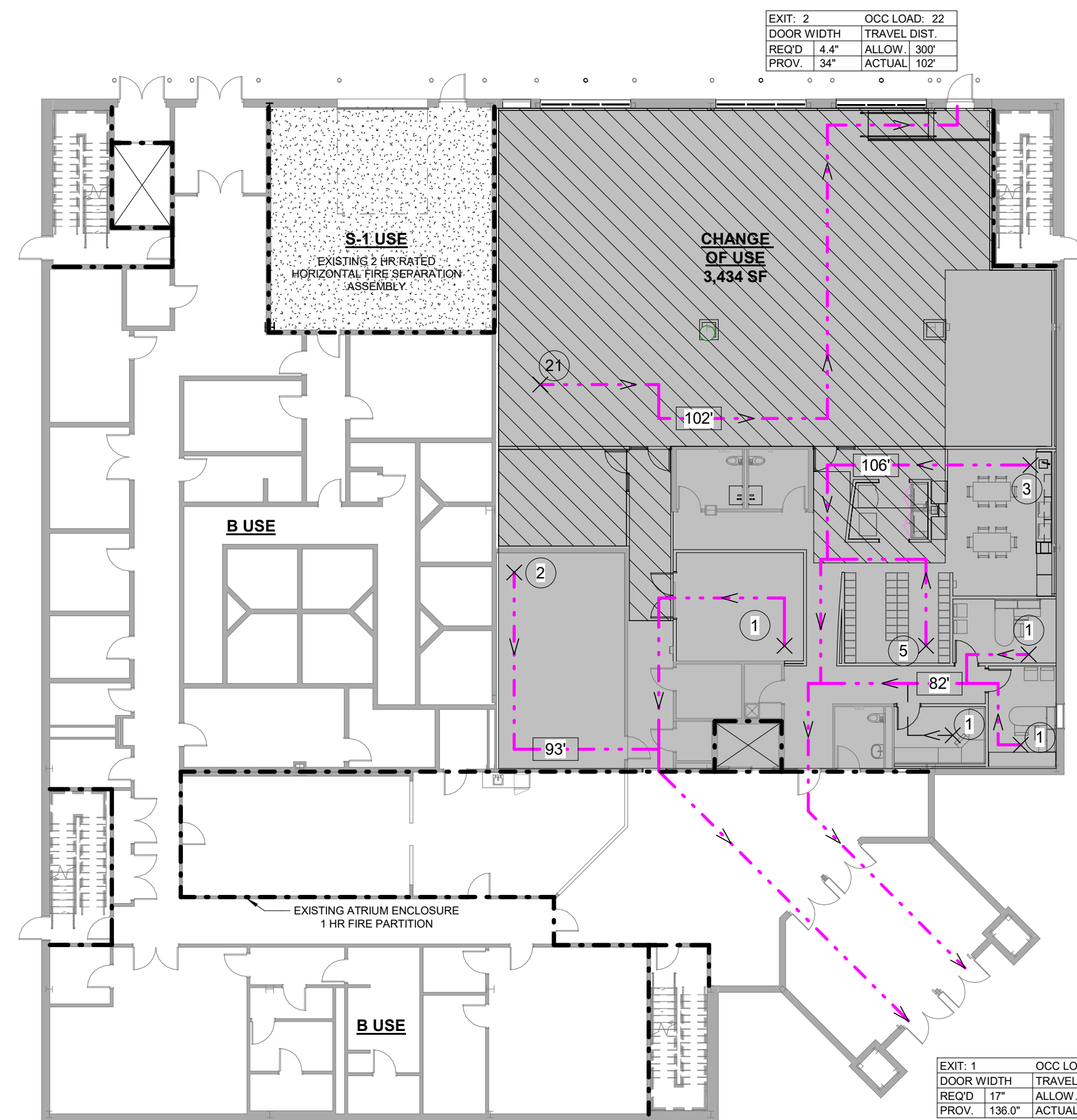




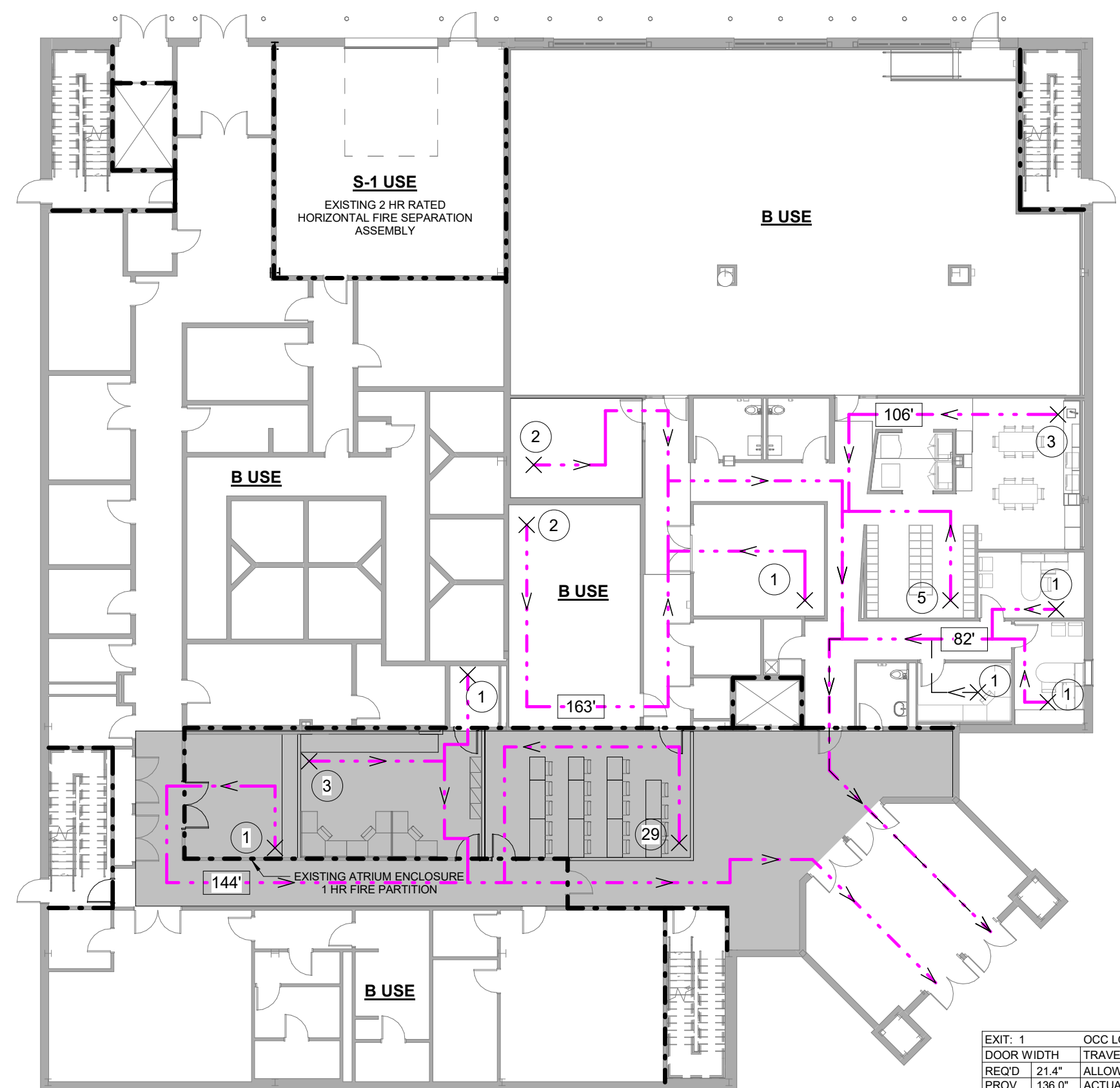




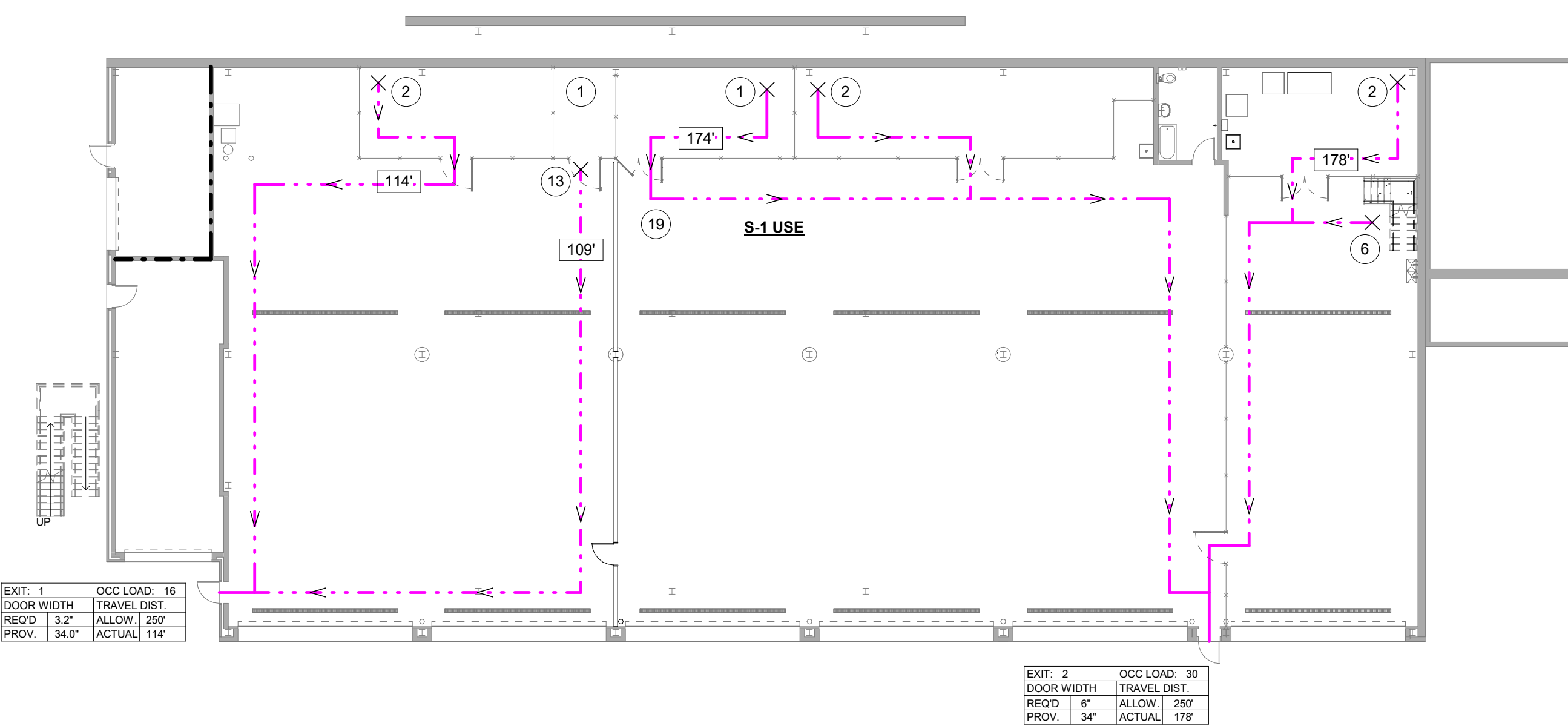




**1** 1ST FLOOR CODE PLAN FROEHLICH BUILDING - PHASE 1  
1/16" = 1'-0"



**2** 1ST FLOOR CODE PLAN FROEHLICH BUILDING - PHASE 2  
1/16" = 1'-0"



**3** 1ST FLOOR CODE PLAN VEHICLE STORAGE BUILDING - PHASE 1  
1/16" = 1'-0"

**BUILDING CODE REFERENCES**

APPLICABLE CODES AND STANDARDS	UCC REFERENCE
New Jersey Uniform Construction Code	N.J.A.C. 5:23
2018 New Jersey International Building Code	N.J.A.C. 5:23-3.14
2015 International Fire Code	N.J.A.C. 5:23-3.14
2018 National Standard Plumbing Code	N.J.A.C. 5:23-3.15
2017 National Electric Code (NFPA 70)	N.J.A.C. 5:23-3.16
Fire Protection Subcode	N.J.A.C. 5:23-3.17
ASHRAE 90.1 - 2016 (Commercial)	N.J.A.C. 5:23-3.18
2018 International Mechanical Code	N.J.A.C. 5:23-3.20
2018 International Fuel Gas Code	N.J.A.C. 5:23-3.22
New Jersey Rehabilitation Subcode	N.J.A.C. 5:23-6
New Jersey Barrier Free Subcode	N.J.A.C. 5:23-7
2018 New Jersey International Building Code Chapter 11	
ANSI A117.1-2009 Accessible and Usable Buildings and Facilities Elevator Subcode	N.J.A.C. 5:23-12
ASME A17.1 Safety Code for Elevators and Escalators (Latest Edition 2016)	
Risk Category	IV
Wind Speed (ASC)	127 Mph (ASCE 7-16)
Seismic Design Category	C

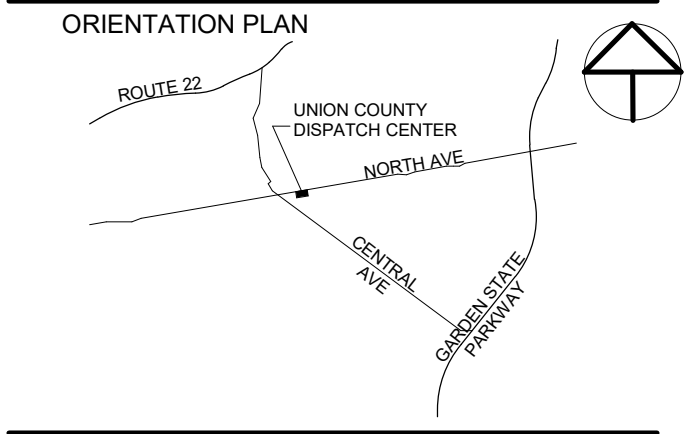
**CODE PLAN LEGEND**

- EXISTING 2 HOUR RATED FIRE WALL
- - - EXISTING 1 HOUR RATED FIRE BARRIER WALL
- - - EXISTING SMOKE SEPERATION BARRIER WALL
- EXIT DISCHARGE PATH
- 1 HOUR RATED SHAFT
- COMMON PATH OF TRAVEL
- REMOTE EXIT ACCESS TRAVEL DISTANCE (IN FEET)
- PATH OF TRAVEL TO POINT OF EXIT
- ACCUMULATED NUMBER OF OCCUPANTS ALONG PATH OF TRAVEL
- FEC FIRE EXTINGUISHER CABINET
- AREA OF SCOPE
- EXISTING FLOOR/CEILING ASSEMBLY
- CHANGE OF USE
- EGRESS EXIT/ ACCESS COMPONENT TAG

ISS/REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

CLIENT

CONSULTANT



PALLUIS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
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P.O. Box 4059  
WARREN, NEW JERSEY 07059  
TEL: 732.560.9700

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**Harry T. Osborne**  
Registered Architect - New York  
License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**County of Union**

PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**  
FROEHLICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME  
**BUILDING CODE ANALYSIS PLANS AND SECTIONS**

JOB NO.: 03009002  
DATE: 04/28/2020  
DRAWN: JRF  
CHECK: JMG  
SCALE: As indicated  
SHEET NO.

**A-002**

02/08/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION













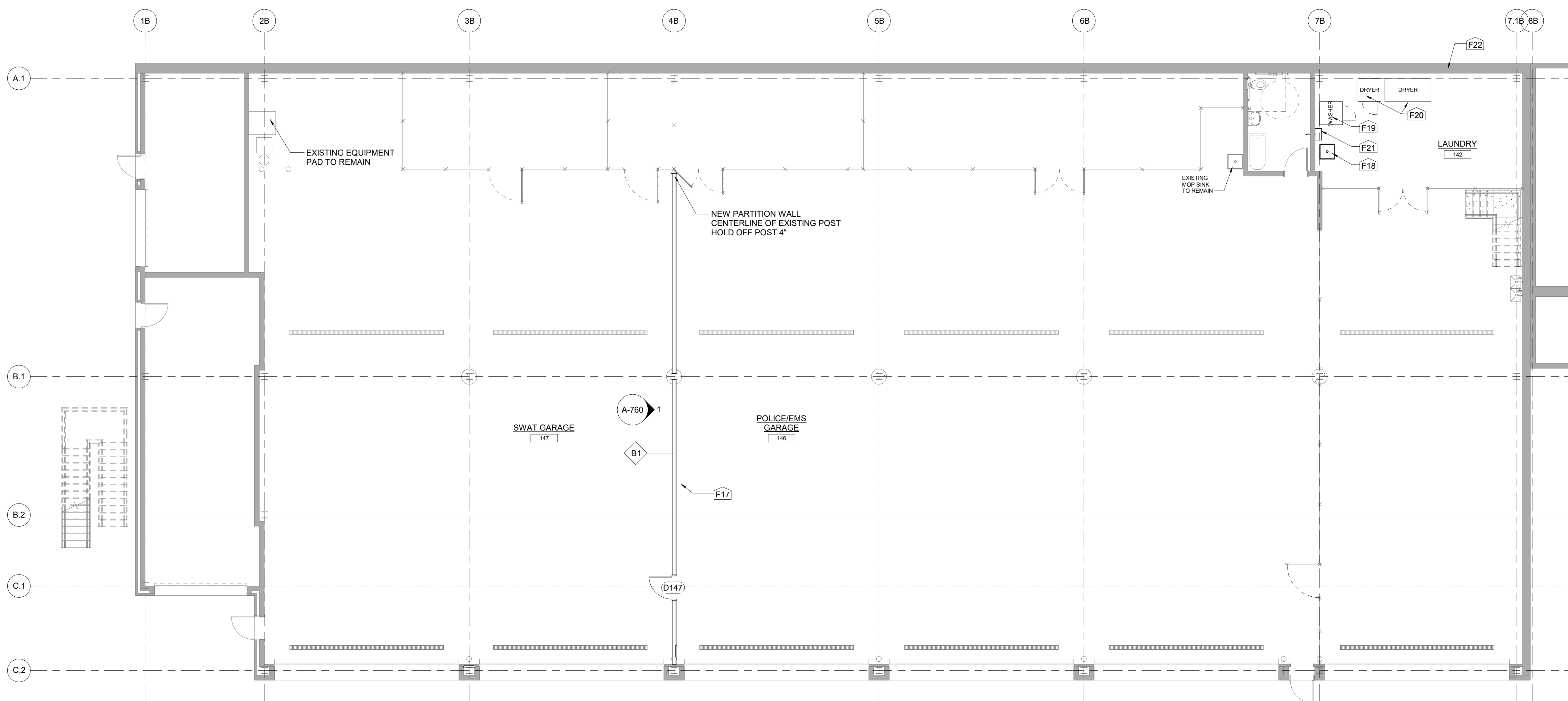




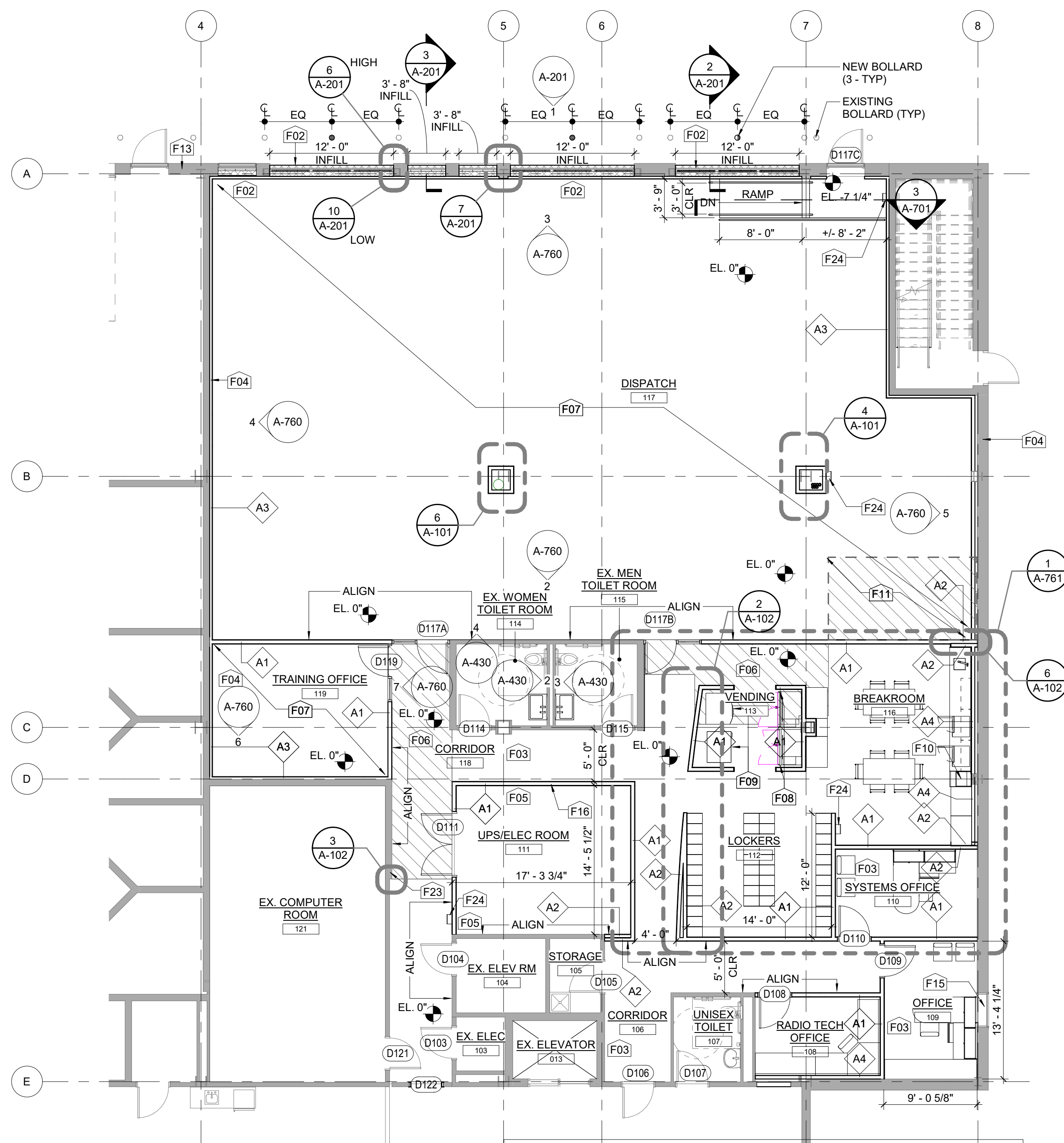






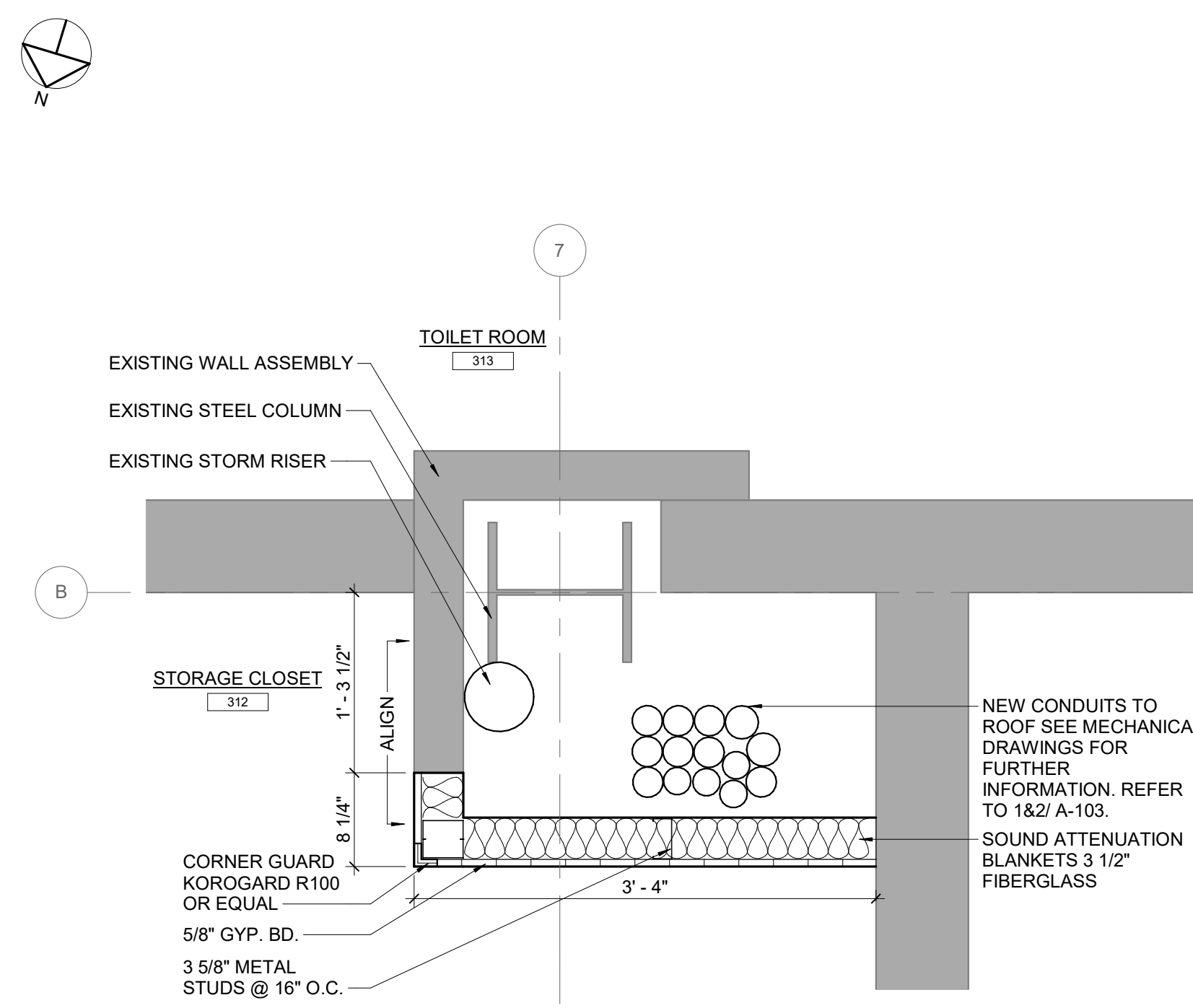


**1** PARTIAL 1ST FLOOR CONSTRUCTION FLOOR PLAN VEHICLE STORAGE BUILDING - PHASE 1  
1/8" = 1'-0"

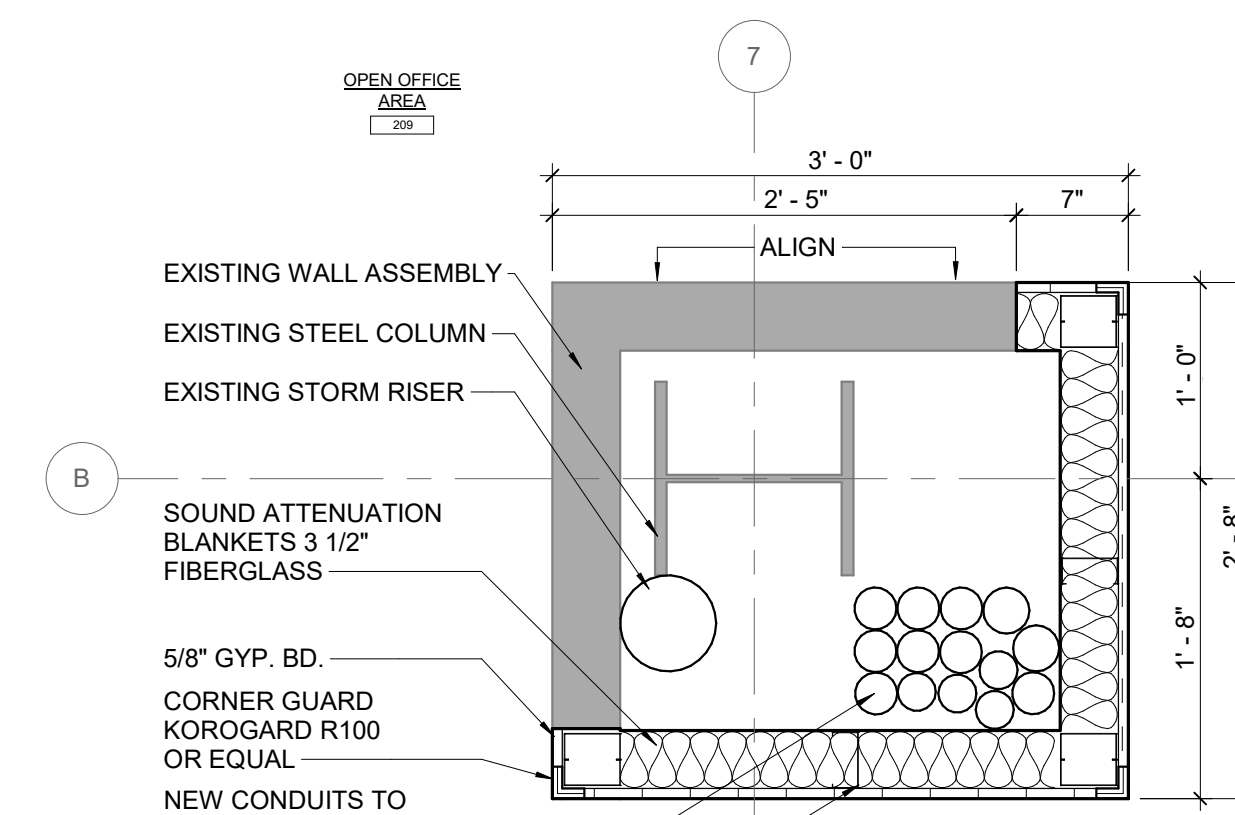


**2** PARTIAL 1ST FLOOR CONSTRUCTION FLOOR PLAN FROEHLICH BUILDING - PHASE 1  
1/8" = 1'-0"

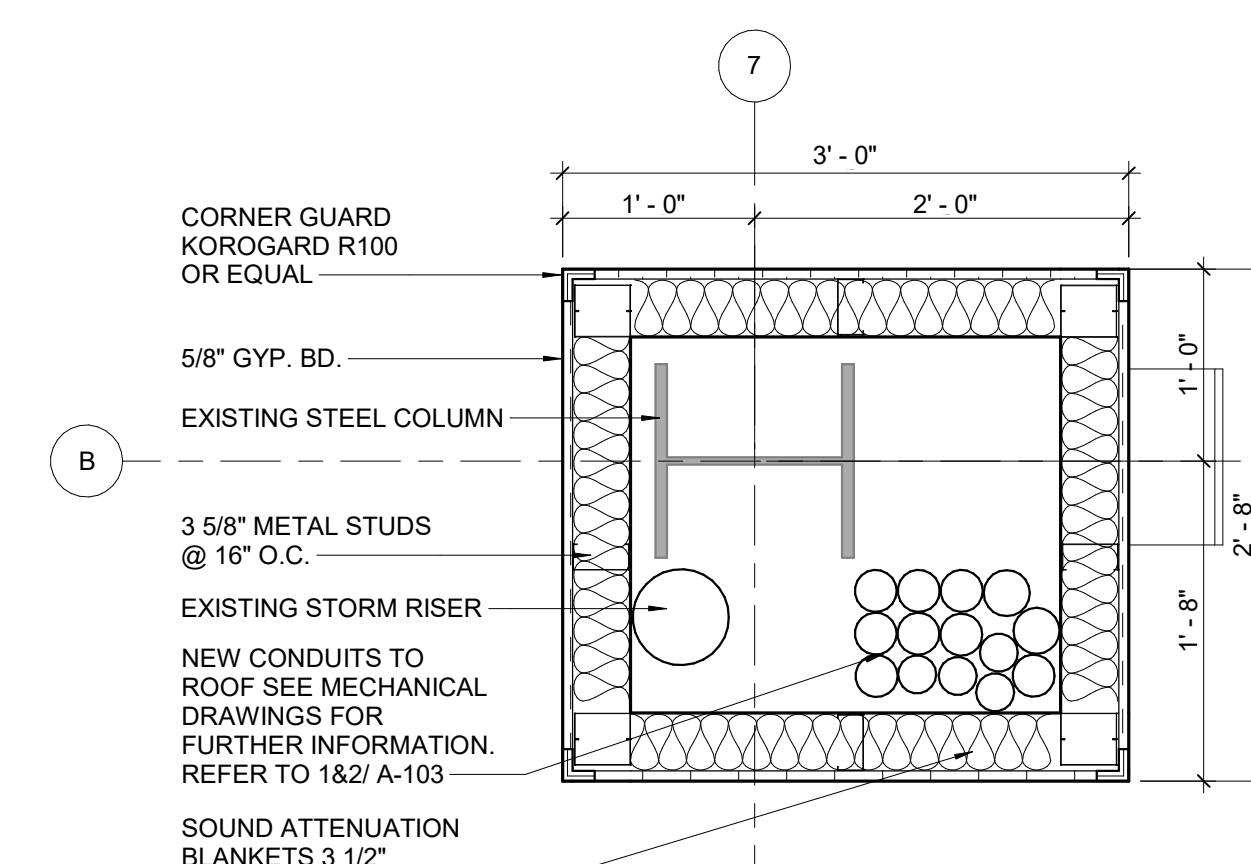
NOTE:  
1. DIMENSIONS OF NEW PARTITIONS TAKEN FROM FACE OF STUD. DIMENSIONS TAKEN FROM EXISTING WALLS ARE FROM FINISHED FACE.  
2. THE INSIDE EDGE OF DOOR FRAMES SHALL BE SET MIN 4" CLEAR FROM THE FINISH FACE OF THE ADJACENT PERPENDICULAR PARTITION UNLESS OTHERWISE DIMENSIONED.  
3. SEE PENETRATION DETAILS ON SHEET A-102.



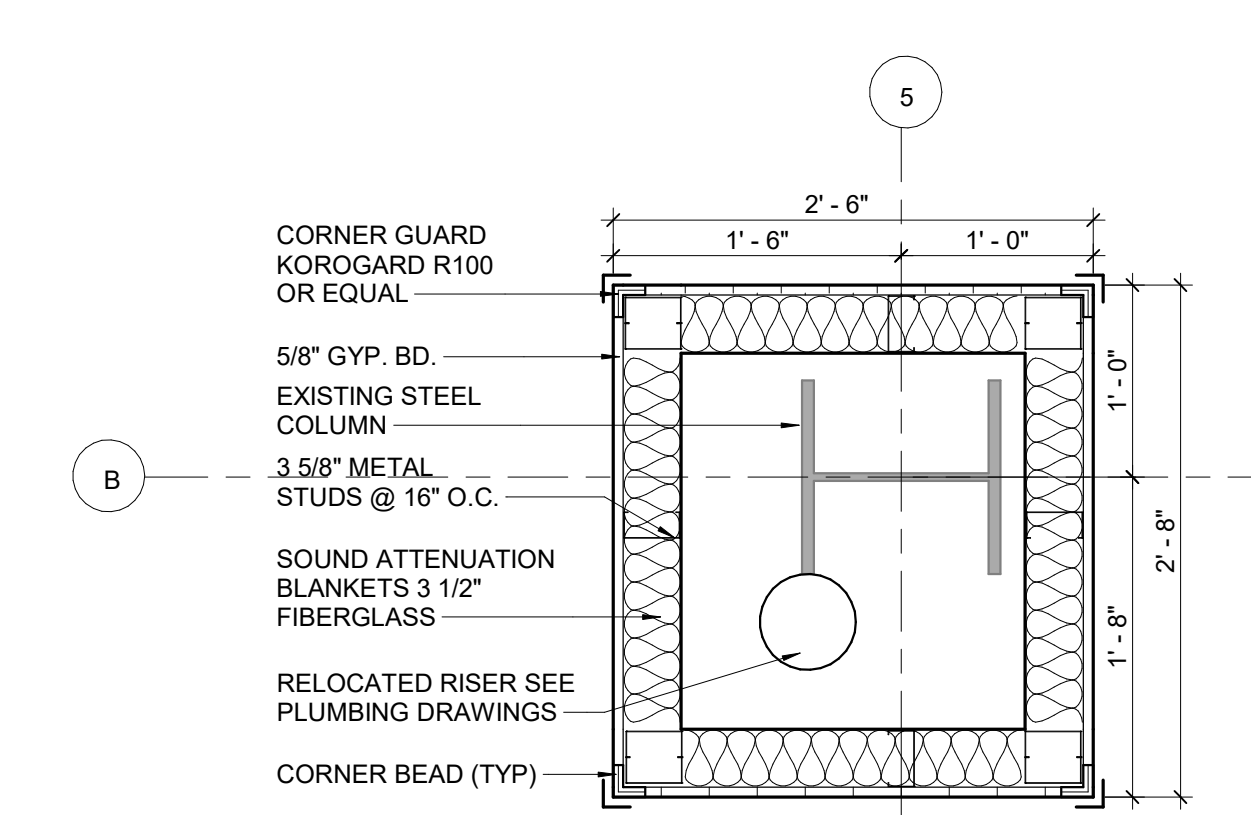
**3** PLAN DETAIL - 3RD FLOOR  
1" = 1'-0"



**5** PLAN DETAIL - 2ND FLOOR  
1" = 1'-0"



**4** PLAN DETAIL - 1ST FLOOR  
1" = 1'-0"



**6** PLAN DETAIL @ 1ST FLOOR  
1" = 1'-0"

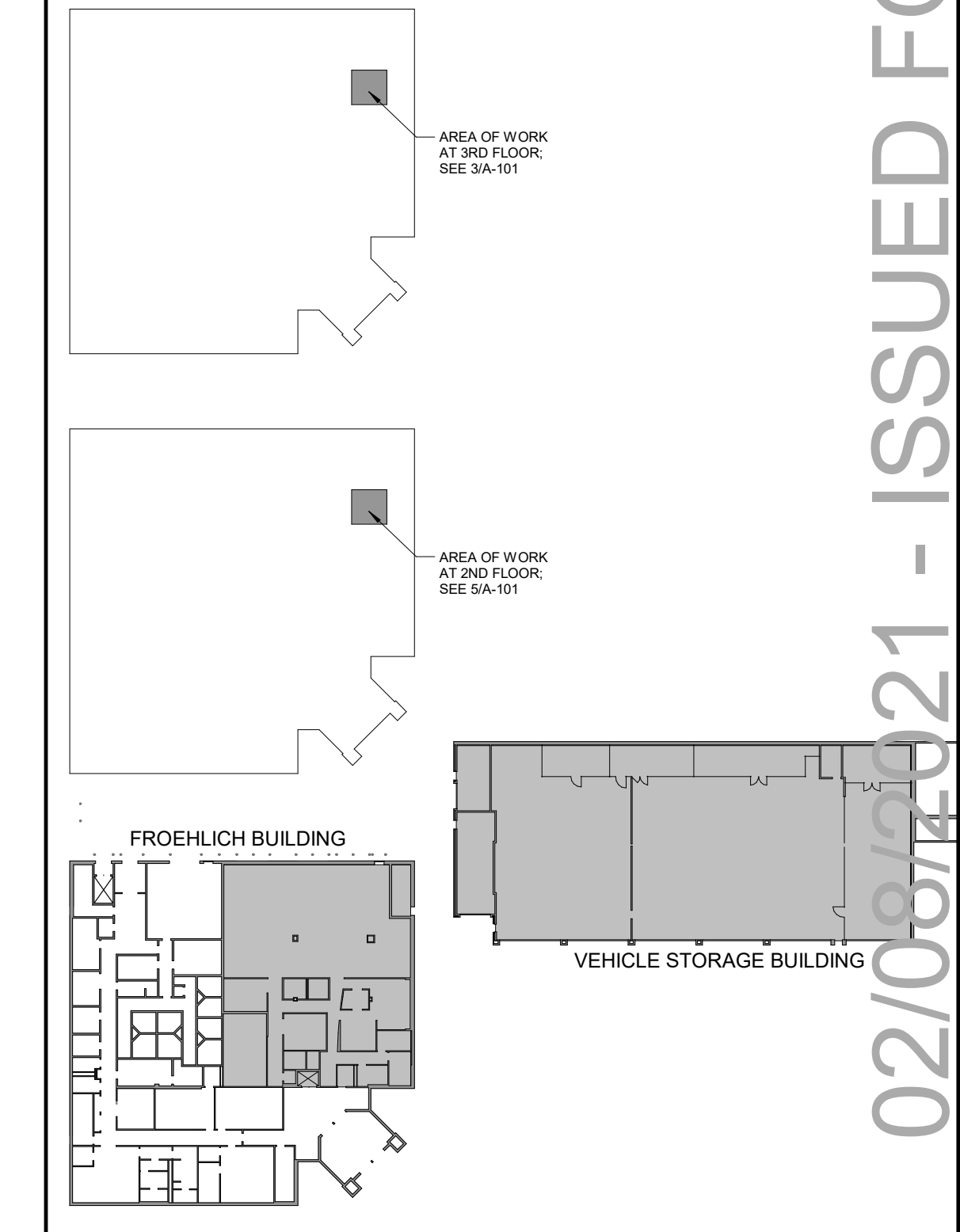
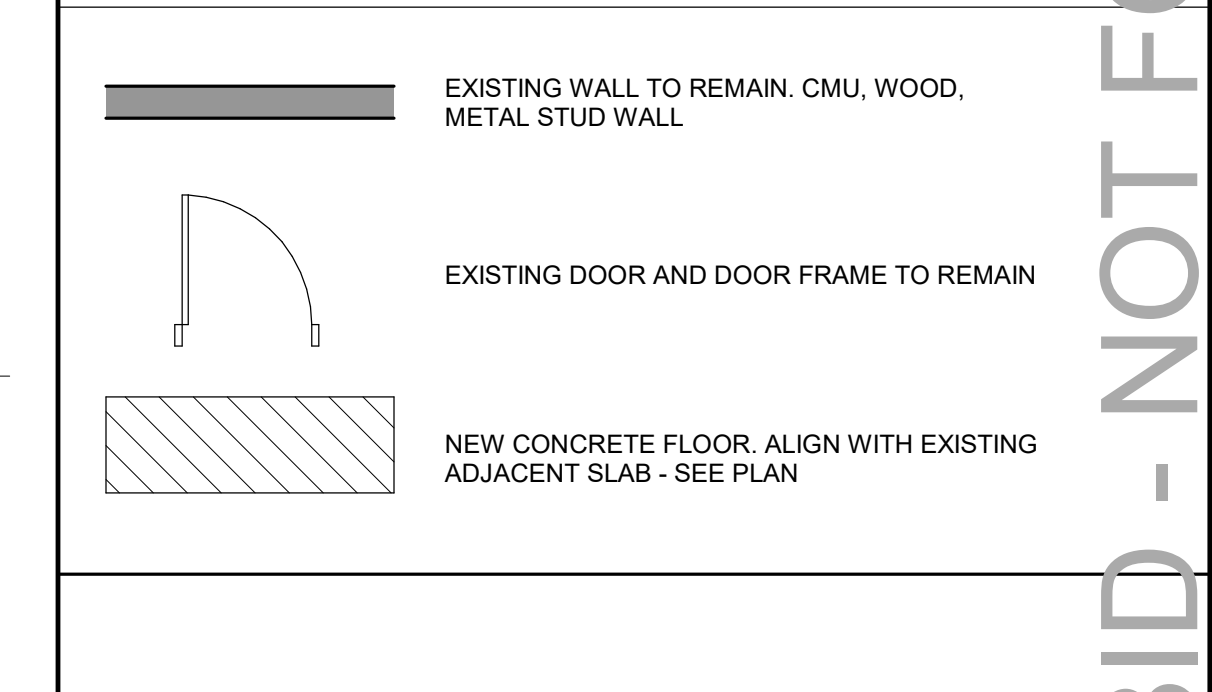
**CONSTRUCTION NOTES**

- DRAWINGS ARE NOT TO BE SCALED.
- ALL DIMENSIONS ARE TO BE VERIFIED ON SITE.
- THIS PLAN IS PROVIDING OVERALL DIMENSIONAL LAYOUT INFORMATION FOR STARTING POINT.
- DIMENSIONS INDICATED ARE FROM EXTERIOR FACE OF GYPSUM SHEATHING, CONCRETE OR CONCRETE BLOCK AT EXTERIOR WALLS AND FACE OF GYPSUM BOARD, CONCRETE AND CONCRETE BLOCK AT INTERIOR PARTITIONS.
- ADDITIONAL INFORMATION ON PARTIAL AND ENLARGED PLANS.
- BRING ALL OMISSIONS AND DISCREPANCIES, INCLUDING DIMENSIONS, TO THE ATTENTION OF THE ARCHITECT IN WRITING PRIOR TO COMMENCEMENT OF ANY WORK.
- MAINTAIN CONTINUITY OF ALL FIRE SEPARATIONS AND PENETRATIONS WITH APPROVED U.L. LISTED FIRE STOPPING SYSTEMS AND FIRE SEALANTS BOTH SIDES OF PARTITIONS. PROVIDE SUBMITTAL PACKAGE.
- MAINTAIN CONTINUITY OF ALL ACOUSTIC SEPARATIONS AND PENETRATIONS WITH ACOUSTIC SEALANT BOTH SIDES OF PARTITIONS.
- ENSURE THAT WHEREVER A FIRE SEPARATION IS INDICATED ON THE DRAWINGS PER DIRECTION OF THE CONSTRUCTION NOTES, ALL COMPONENTS OF THE ASSEMBLY SHALL BE OF APPROVED MATERIALS, AND INSTALLATION/FABRICATION PROCEDURES ARE PER DIRECTION OF THE INDICATED UNDERWRITERS LABORATORIES OF AMERICA'S LATEST EDITION MANUAL AND OTHERWISE MEETING THE REQUIREMENTS OF THE STATE OF NEW JERSEY CODES. ALL FIRE SEPARATIONS MUST BE CONTINUOUS WITHIN THEIR EXTENT, AND ALL JOINTS TO BE SMOKE TIGHT.
- PROVIDE SOLID METAL BLOCKING IN GYPSUM BOARD PARTITIONS FOR ATTACHMENT OF EQUIPMENT, FIXTURES, HANDRAILS, LADDERS, ETC. FULLY COORDINATE ALL ADDITIONAL SUPPORT REQUIRED FOR ANCHORAGE OF MECHANICAL EQUIPMENT OR DUCTS AND ELECTRICAL FIXTURES.

**CONSTRUCTION TAG NOTES**

- F02 INFILL EXISTING MASONRY DOOR OPENING TO MATCH EXISTING, ALIGN SURFACES.  
 F03 PATCH AND REPAIR EXISTING SURFACES DAMAGED BY THE REMOVAL OF PARTITIONS AND EQUIPMENT.  
 F04 PROVIDE METAL BLOCKING IN WALL FOR WALL MOUNTED DISPLAYS.  
 F05 LAMINATE 3/4" PAINTED FIRE RET TREATED PLYWOOD SHEATHING BLOCKING FOR MOUNTING EQUIPMENT.  
 F06 INFILL EXISTING FLOOR SLAB THIS AREA, ALIGN FLOOR SLAB SURFACES. SEE STRUCTURAL DRAWINGS FOR FURTHER INFORMATION.  
 F07 PROVIDE A NEW RAISED ACCESS FLOORING SYSTEM, RAMP, GUARDRAILS AND ALL ASSOCIATED ACCESSORIES.  
 F08 NEW FULL HEIGHT REFRIGERATOR/FREEZER BY OWNER.  
 F09 NEW VENDING MACHINE BY OWNERS VENDOR.  
 F10 PROVIDE NEW WALL MOUNTED BOTTLE FILLER BY CONTRACTOR. SEE PLUMBING DWGS.  
 F11 INSTALL NEW 4" CONCRETE FLOOR SLAB FLUSH WITH ADJACENT SLAB. PREP FOR RAISED FLOOR SYSTEM.  
 F12 POWER WASH ENTIRE ELEVATION OF EXISTING AND NEW MASONRY FROM GRADE TO COPING AFTER COMPLETION OF INFILLS.  
 F15 PROVIDE 3M CLEAR SAFETY AND SECURITY WINDOW FILM OR APPROVED EQUAL LAMINATE WITH PAINTED 5/8" FIRE RESISTANT PLYWOOD.  
 F17 PROVIDE WELDED WOVEN WIRE INFILL PANELS EXTENT OF PARTITION OPENINGS. CONNECT DIRECTLY TO EXISTING STEEL BEAM AND NEW GYP. BD. PARTITION. PROVIDE INTERMEDIATE POSTS 4' O.C. MAX. FRAME AROUND EXISTING PIPING AND EQUIPMENT AS REQUIRED. VERIFY ALL DIMENSIONS IN FIELD.  
 F18 PROVIDE NEW MOP SERVICE SINK. SEE PLUMBING DRAWINGS FOR FURTHER INFORMATION.  
 F19 RELOCATED WASHER. SEE PLUMBING DRAWINGS FOR FURTHER INFORMATION.  
 F20 RELOCATED DRYER AND DRYER CABINET. SEE MEP DRAWINGS FOR UTILITY REQUIREMENTS.  
 F21 NEW WALL MOUNTED HOT WATER HEATER UNIT. SEE PLUMBING DRAWINGS FOR UTILITY REQUIREMENTS.  
 F22 PROVIDE NEW 6" AND 8" DRYER EXHAUST DUCTWORK, EXTENDED FROM EACH RELOCATED DRYER TO TERMINATE THROUGH NEW WALL OPENING WITH WEATHER CAP. INSTALL USING MINIMUM NUMBER OF BENDS AND SHORTEST LENGTH OF DUCTWORK POSSIBLE.  
 F23 LAMINATE 5/8" GYP. BD. OVER EXISTING MASONRY PARTITION TO 6" ABOVE THE CEILING. ALIGN WITH NEW PARTITIONS.  
 F24 PROVIDE (4) NEW FEC UNITS - FINAL LOCATIONS DETERMINED BY ARCHITECT IN FIELD.

**CONSTRUCTION PLAN LEGEND**

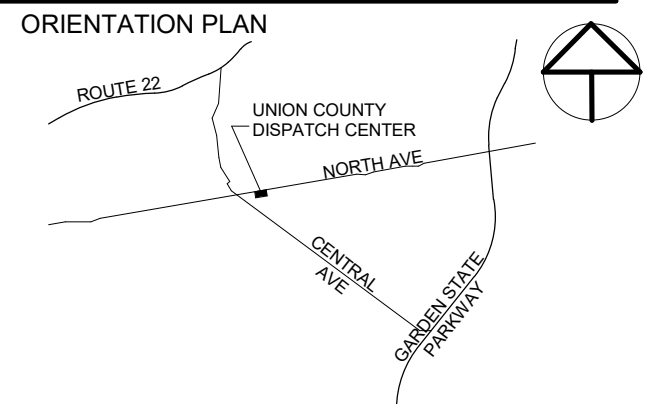


**KEY PLAN**

ISS/REV.	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

CLIENT

CONSULTANT



PAULUS SOKOLOWSKI and SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
 P.O. Box 4039  
 WARREN, NEW JERSEY 07059  
 TEL: 732.560.9700

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**Harry T. Osborne**  
 Registered Architect - New York  
 License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**County of Union**



PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROEHLICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME

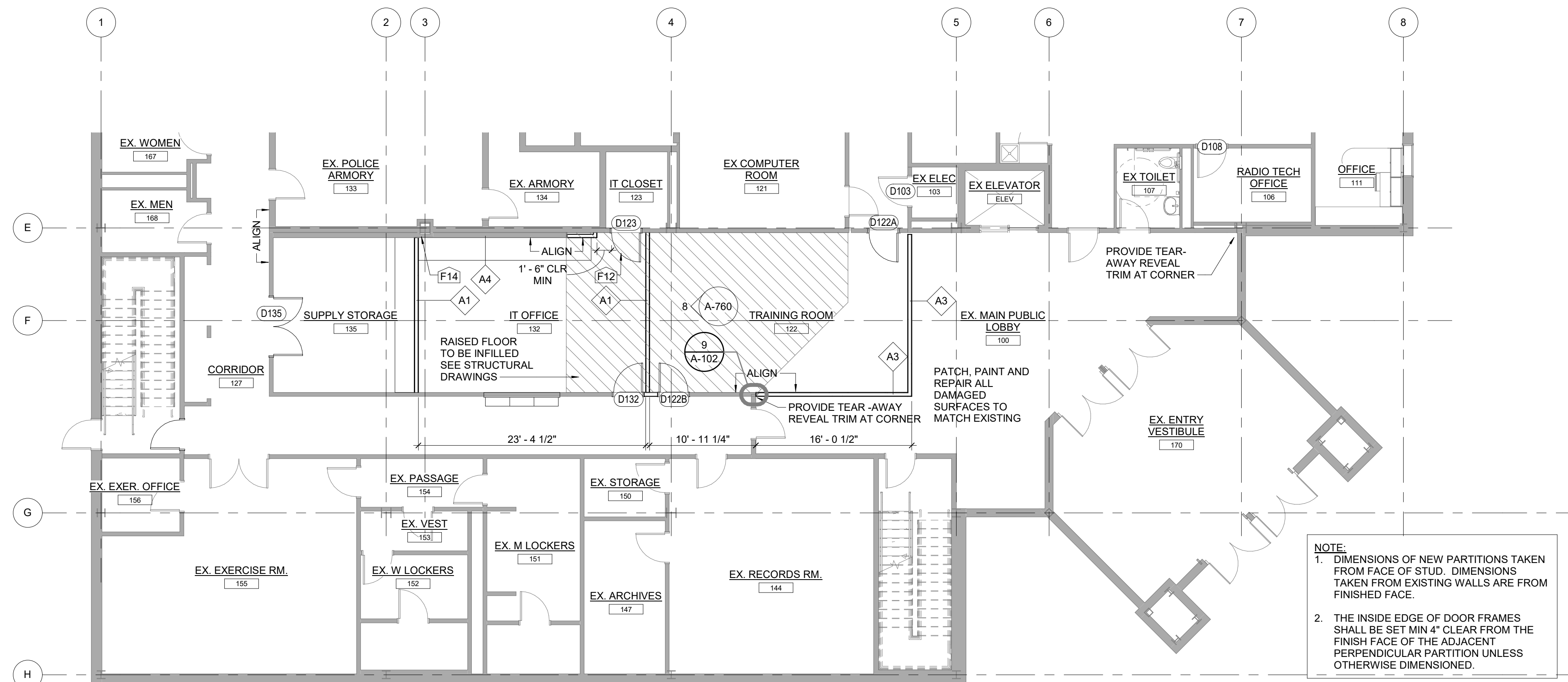
**CONSTRUCTION FLOOR PLAN - PHASE 1**

JOB NO.: 03080002  
 DATE: 04/28/2020  
 DRAWN: JRF/IMY  
 CHECK: JMG  
 SCALE: As Indicated  
 SHEET NO.

**A-101**

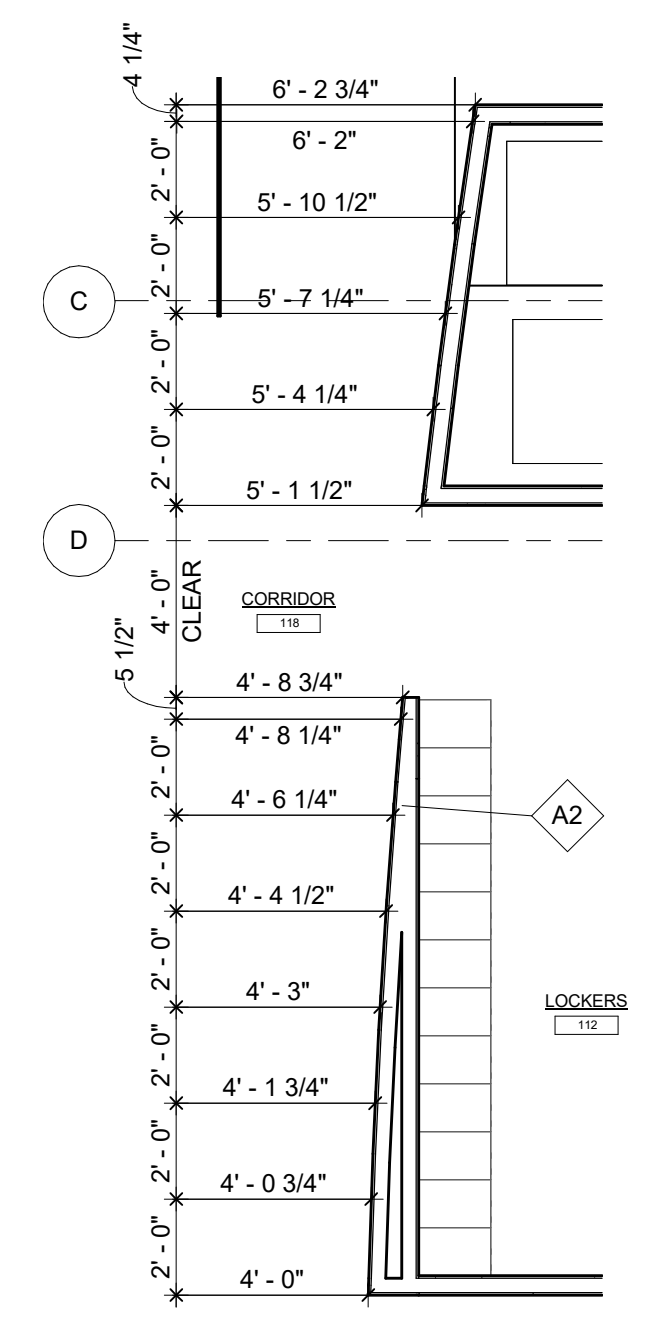
02/08/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION



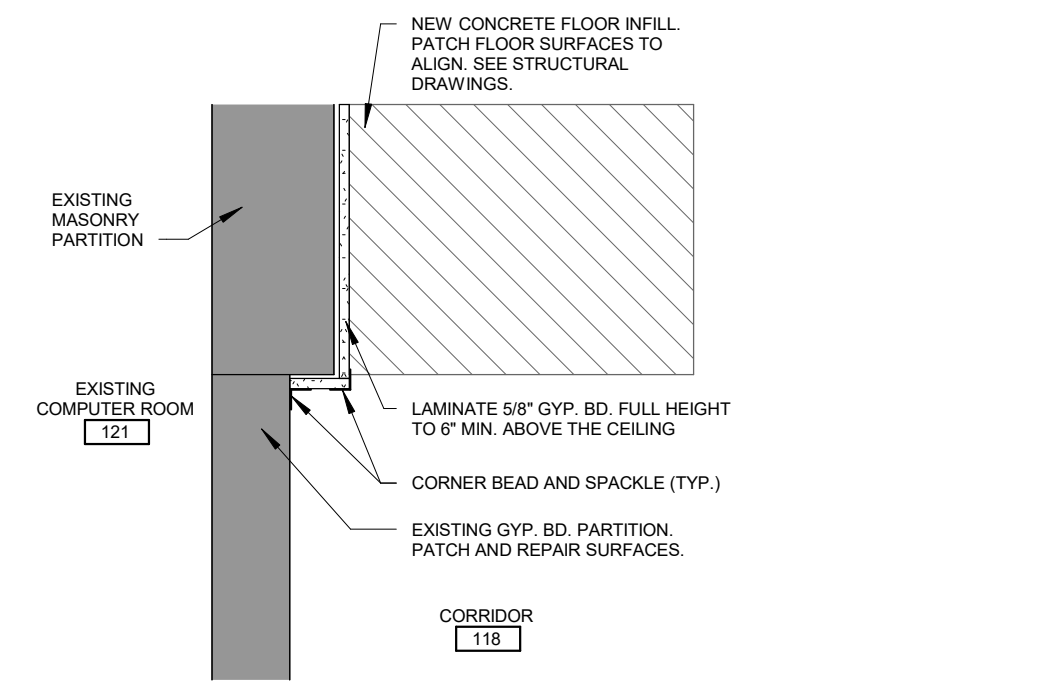


**1 PARTIAL 1ST FLOOR CONSTRUCTION FLOOR PLAN FROEHLICH BUILDING - PHASE 2**  
1/8" = 1'-0"

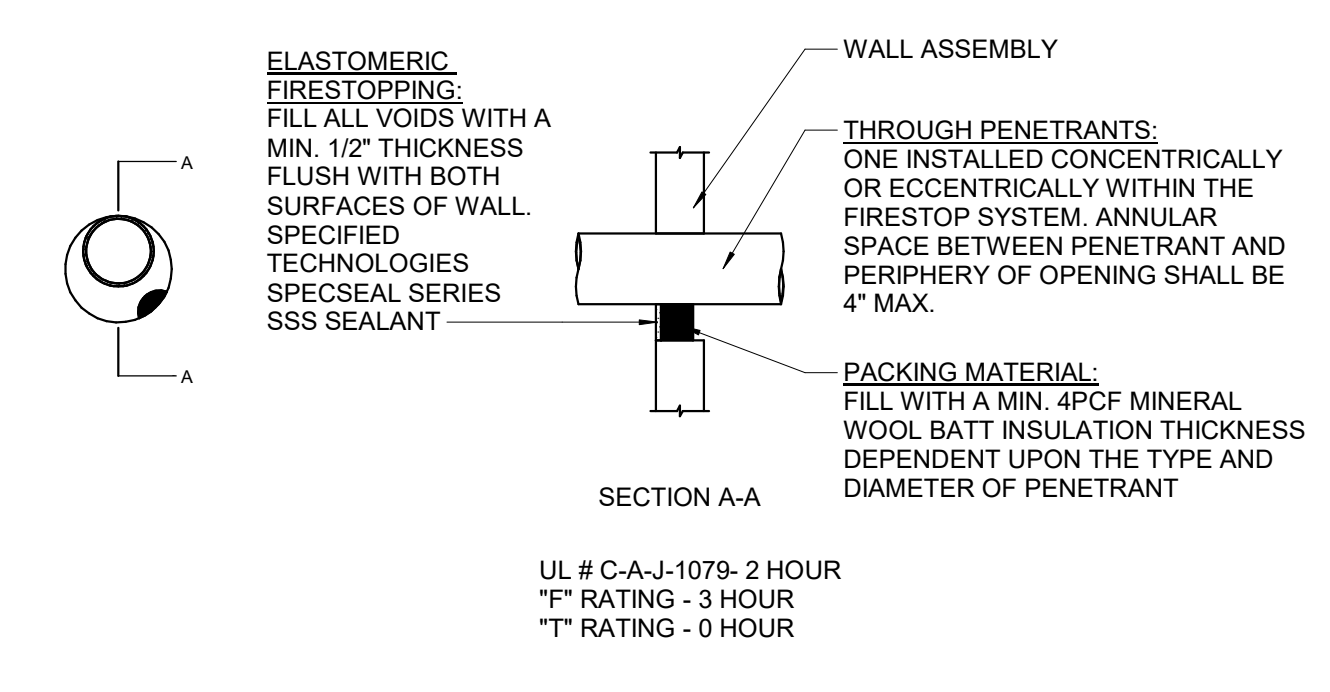
**2 PLAN DETAIL CURVED WALL**  
1/4" = 1'-0"



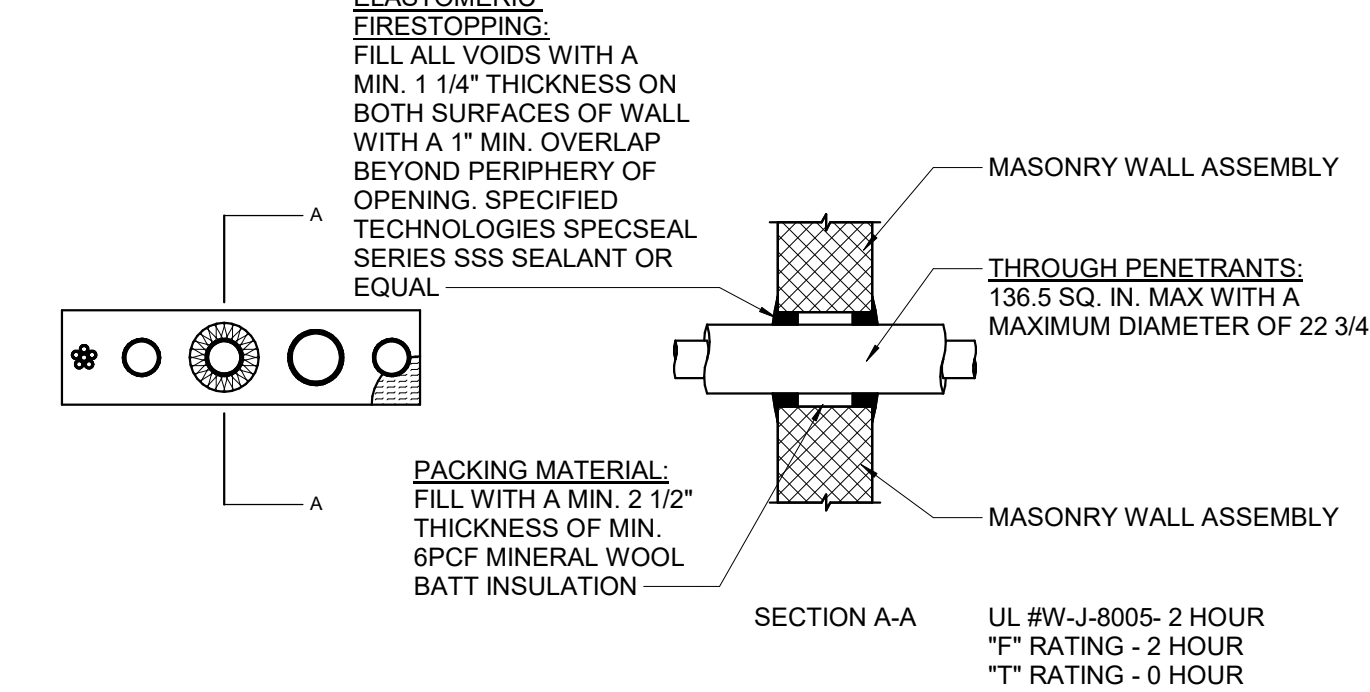
**3 PLAN DETAIL COMPUTER ROOM**  
1" = 1'-0"



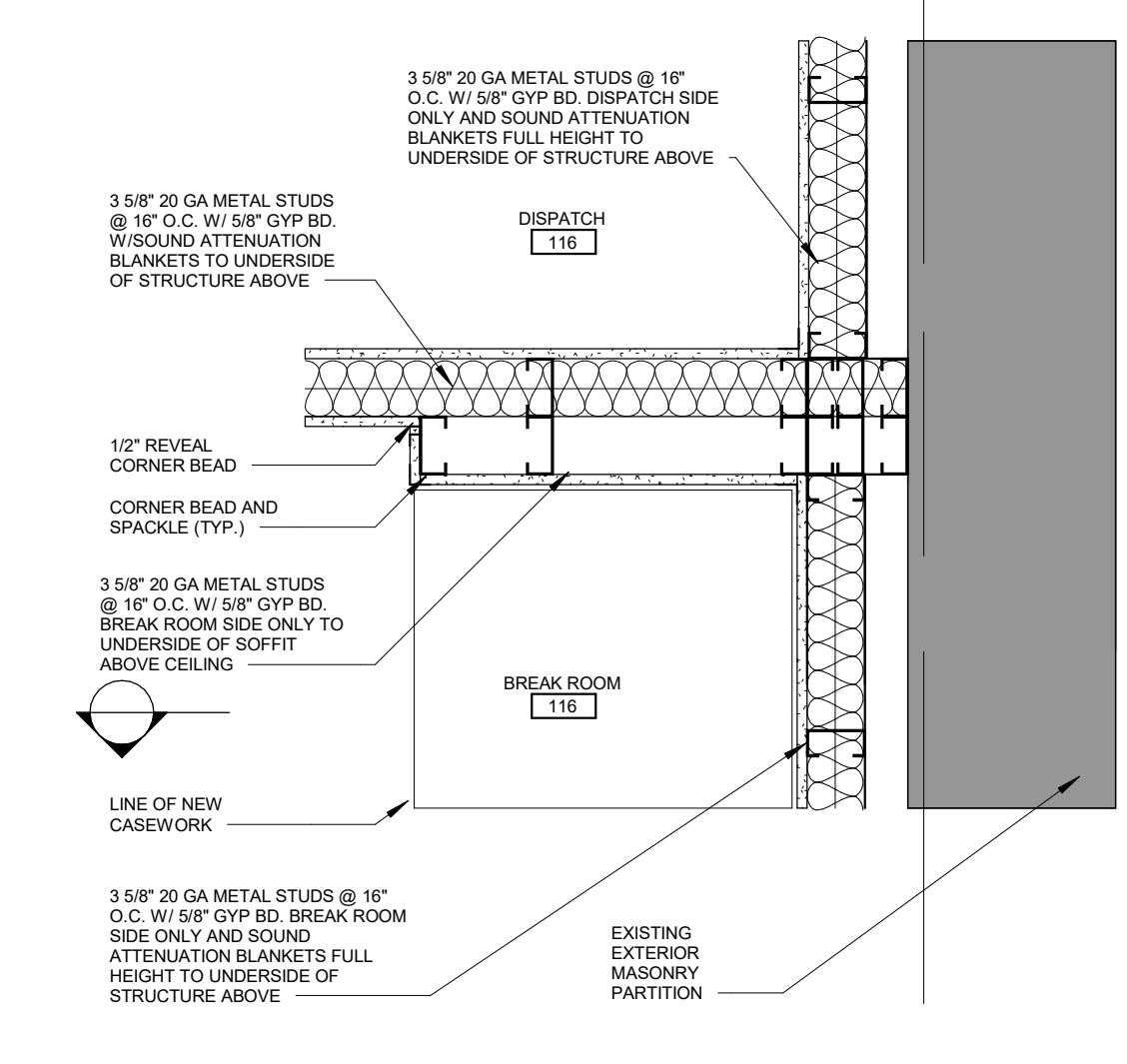
**4 PENETRATION DETAIL @ WALL**  
3/4" = 1'-0"



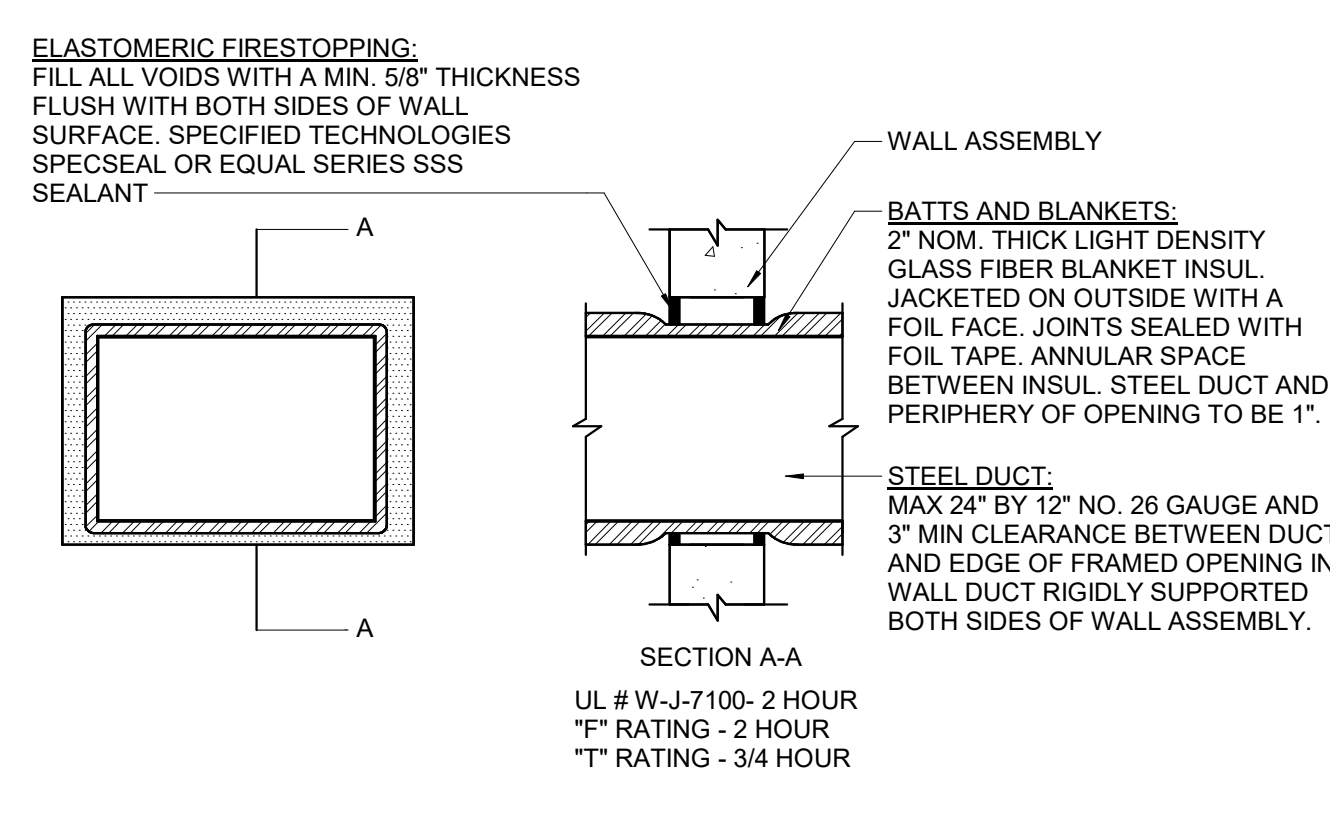
**5 PENETRATION DETAIL @ WALL**  
3/4" = 1'-0"



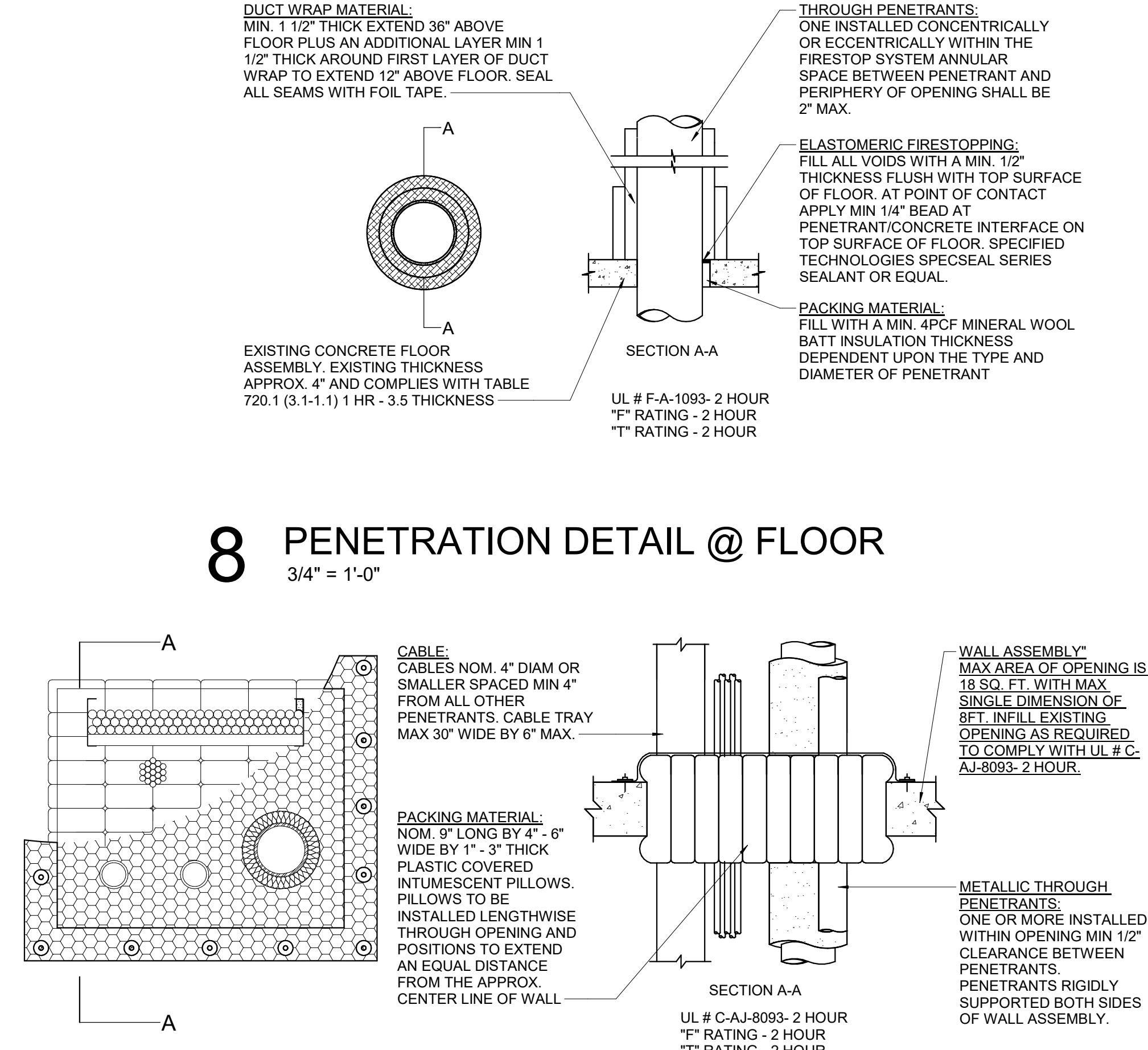
**6 PLAN DETAIL @ BREAKROOM**  
1" = 1'-0"



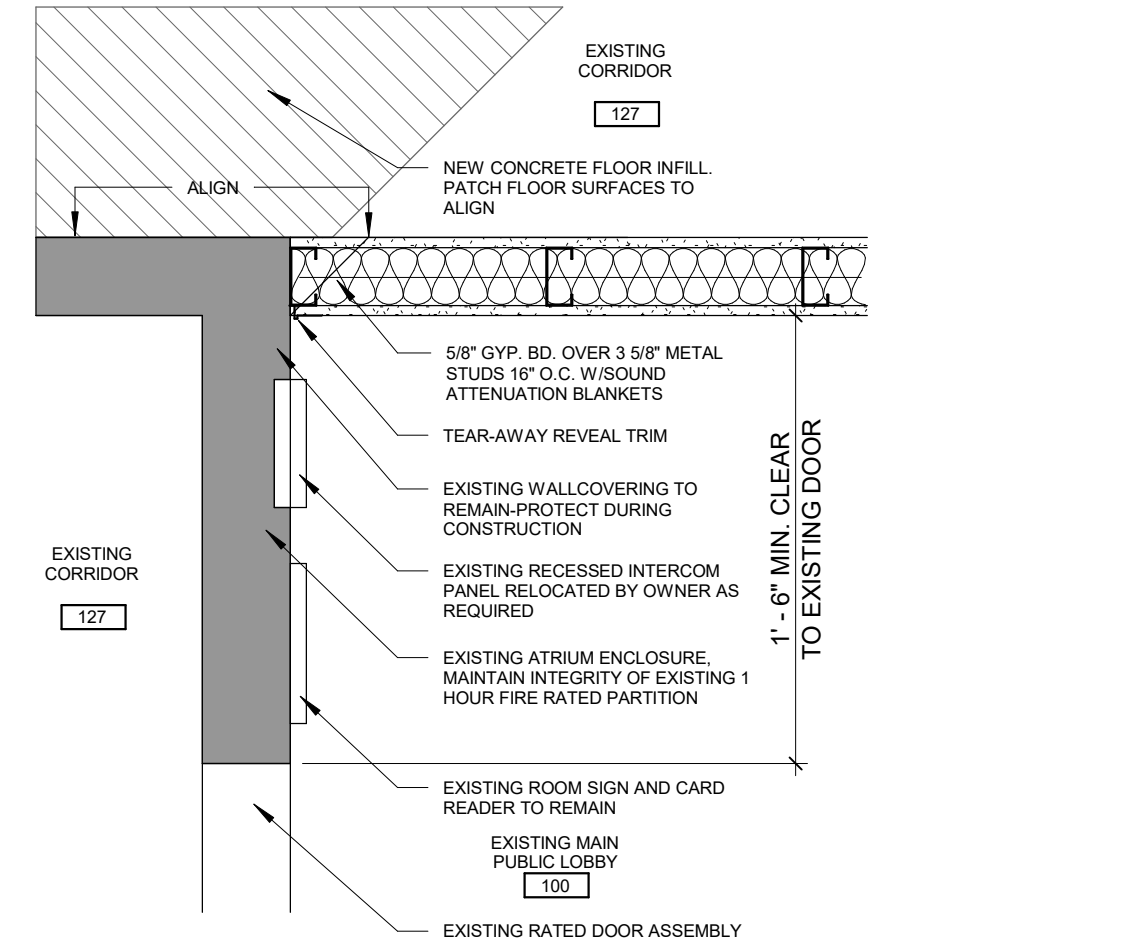
**7 PENETRATION DETAIL @ WALL**  
3/4" = 1'-0"



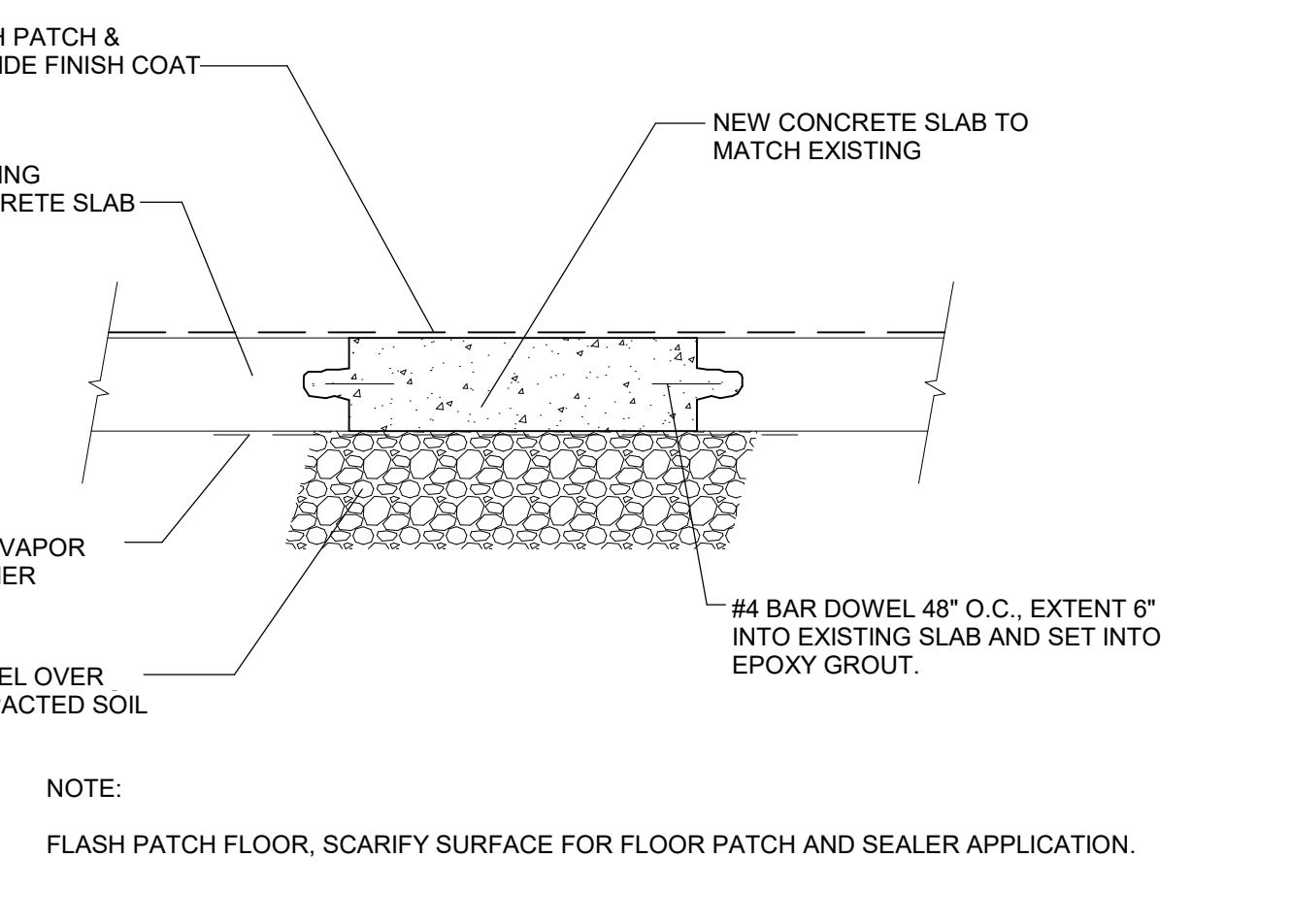
**8 PENETRATION DETAIL @ FLOOR**  
3/4" = 1'-0"



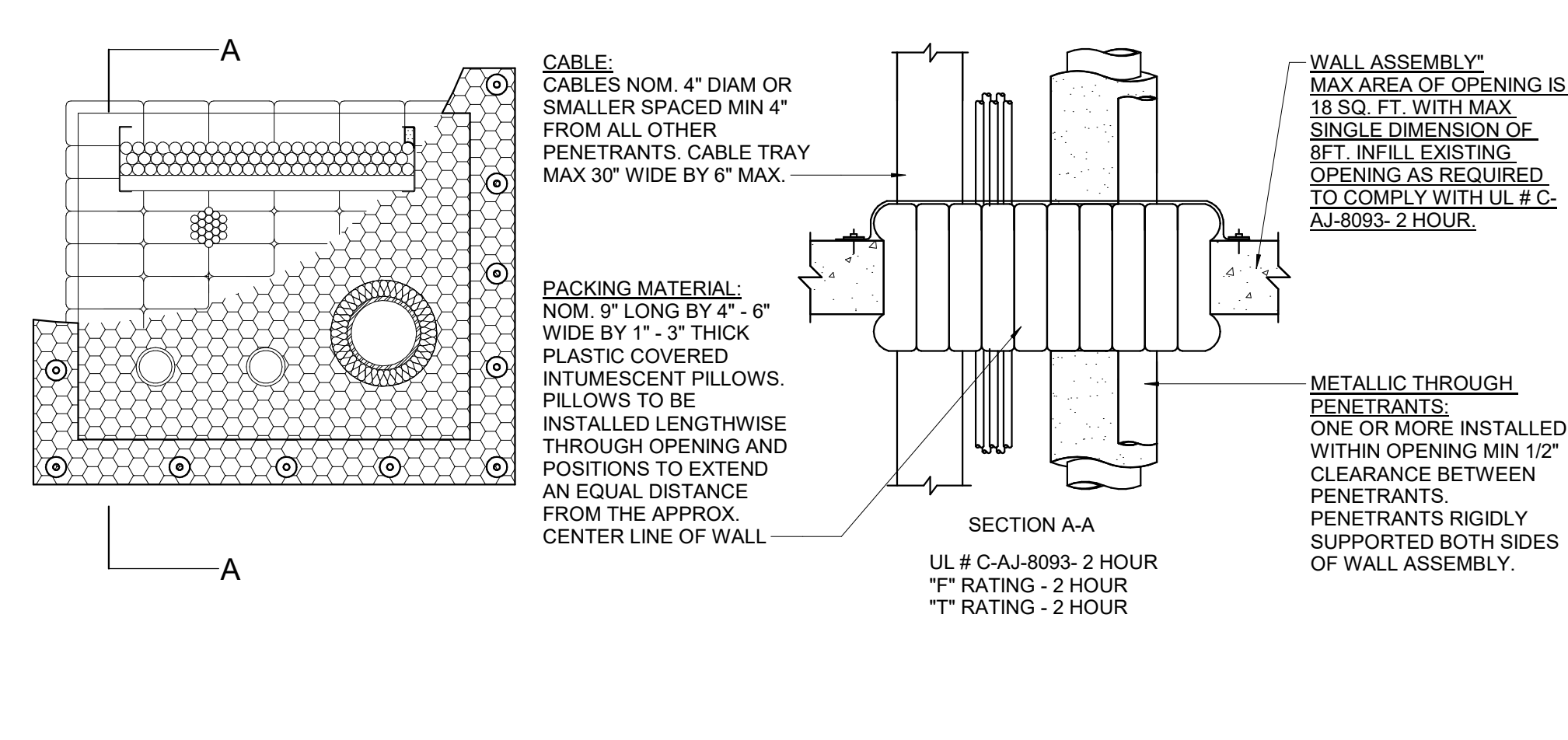
**9 PLAN DETAIL @ TRAINING ROOM**  
1" = 1'-0"



**10 CONCR SLAB DTL TYP**  
1/4" = 1'-0"



**11 PENETRATION DETAIL @ WALL**  
3/4" = 1'-0"



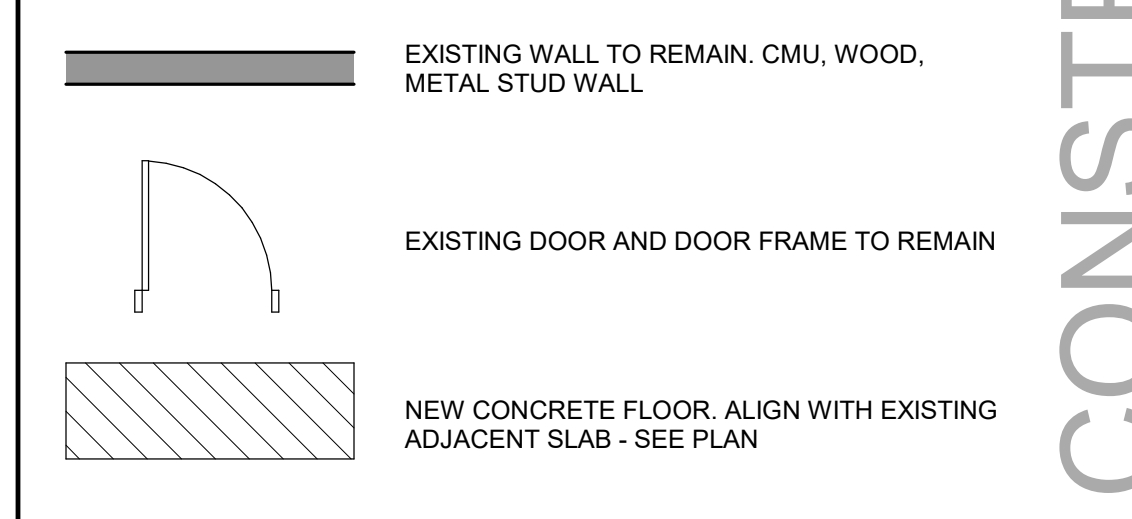
**CONSTRUCTION NOTES**

- DRAWINGS ARE NOT TO BE SCALED.
- ALL DIMENSIONS ARE TO BE VERIFIED ON SITE.
- THIS PLAN IS PROVIDING OVERALL DIMENSIONAL LAYOUT INFORMATION FOR STARTING POINT.
- DIMENSIONS INDICATED ARE FROM EXTERIOR FACE OF GYPSUM SHEATHING, CONCRETE OR CONCRETE BLOCK AT EXTERIOR WALLS AND FACE OF GYPSUM BOARD, CONCRETE AND CONCRETE BLOCK AT INTERIOR PARTITIONS.
- ADDITIONAL INFORMATION ON PARTIAL AND ENLARGED PLANS.
- BRING ALL OMISSIONS AND DISCREPANCIES, INCLUDING DIMENSIONS, TO THE ATTENTION OF THE ARCHITECT IN WRITING PRIOR TO COMMENCEMENT OF ANY WORK.
- MAINTAIN CONTINUITY OF ALL FIRE SEPARATIONS AND PENETRATIONS WITH APPROVED U.L. LISTED FIRE STOPPING SYSTEMS AND FIRE SEALANTS BOTH SIDES OF PARTITIONS. PROVIDE SUBMITTAL PACKAGE.
- MAINTAIN CONTINUITY OF ALL ACOUSTIC SEPARATIONS AND PENETRATIONS WITH ACOUSTIC SEALANT BOTH SIDES OF PARTITIONS.
- ENSURE THAT WHEREVER A FIRE SEPARATION IS INDICATED ON THE DRAWINGS PER DIRECTION OF THE CONSTRUCTION NOTES, ALL COMPONENTS OF THE ASSEMBLY SHALL BE OF APPROVED MATERIALS, AND INSTALLATION/FABRICATION PROCEDURES ARE PER DIRECTION OF THE INDICATED UNDERWRITERS LABORATORIES OF AMERICA'S LATEST EDITION MANUAL AND OTHERWISE MEETING THE REQUIREMENTS OF THE STATE OF NEW JERSEY CODES. ALL FIRE SEPARATIONS MUST BE CONTINUOUS WITHIN THEIR EXTENT, AND ALL JOINTS TO BE SMOKE TIGHT.
- PROVIDE SOLID METAL BLOCKING IN GYPSUM BOARD PARTITIONS FOR ATTACHMENT OF EQUIPMENT, FIXTURES, HANDRAILS, LADDERS, ETC. FULLY COORDINATE ALL ADDITIONAL SUPPORT REQUIRED FOR ANCHORAGE OF MECHANICAL EQUIPMENT OR DUCTS AND ELECTRICAL FIXTURES.

**CONSTRUCTION TAG NOTES**

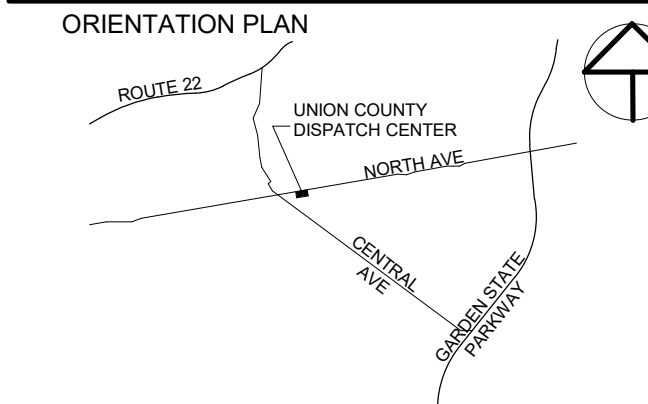
- F12 REINSTALL EXISTING DOOR & FRAME, MODIFIED FOR REVERSED DOOR SWING.
- F14 LAMINATE 5/8" GYP TO EXISTING CMU COLUMN ENCLOSURE.

**CONSTRUCTION PLAN LEGEND**



ISS / REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

CLIENT  
CONSULTANT



PALLIS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
67A MOUNTAIN BOULEVARD EXTENSION  
P.O. Box 4059  
WARREN, NEW JERSEY 07059  
TEL: 732.560.9700

ALL DIMENSIONS MUST BE VERIFIED BY THE CONTRACTOR. NOTIFY PALLIS SOKOLOWSKI AND SARTOR ENGINEERING, PC OF ANY CONFLICTS. BEFORE PROCEEDING TO THE CONSTRUCTION OF ANY PART OF THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING DIMENSIONS. ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO OBTAIN DIMENSIONS. THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE PROJECT AND ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR ANY OTHER PROJECT. THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR RECONSTRUCTION WITHOUT THE WRITTEN CONSENT OF PALLIS SOKOLOWSKI AND SARTOR ENGINEERING, PC. THESE DRAWINGS ARE SPECIFICALLY DESIGNATED AS "CONSTRUCTION DRAWINGS" AND ARE NOT TO BE USED FOR ANY OTHER PURPOSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING DIMENSIONS. ALL DIMENSIONS SHALL BE AS NOTED IN WORDS OR NUMBERS ON THE CONTRACT DRAWINGS. DO NOT SCALE THE DRAWINGS TO OBTAIN DIMENSIONS. THESE CONTRACT DRAWINGS CONTAIN DATA INTENDED SPECIFICALLY FOR THE PROJECT AND ARE NOT INTENDED FOR USE ON EXTENSIONS OF THIS PROJECT OR FOR ANY OTHER PROJECT. THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION OR RECONSTRUCTION WITHOUT THE WRITTEN CONSENT OF PALLIS SOKOLOWSKI AND SARTOR ENGINEERING, PC. ALL RIGHTS RESERVED.

**Harry T. Osborne**  
Registered Architect - New York  
License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**County of Union**



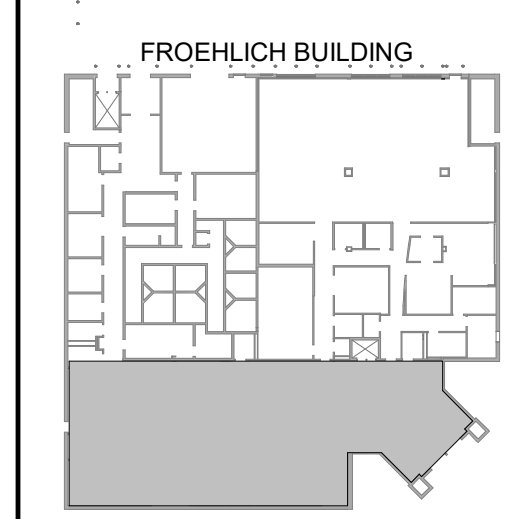
PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROEHLICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME  
**CONSTRUCTION FLOOR PLAN - PHASE 2**

JOB NO.: 03009002  
DATE: 04/28/2020  
DRAWN: JRF/IMY  
CHECK: JMG  
SCALE: As Indicated

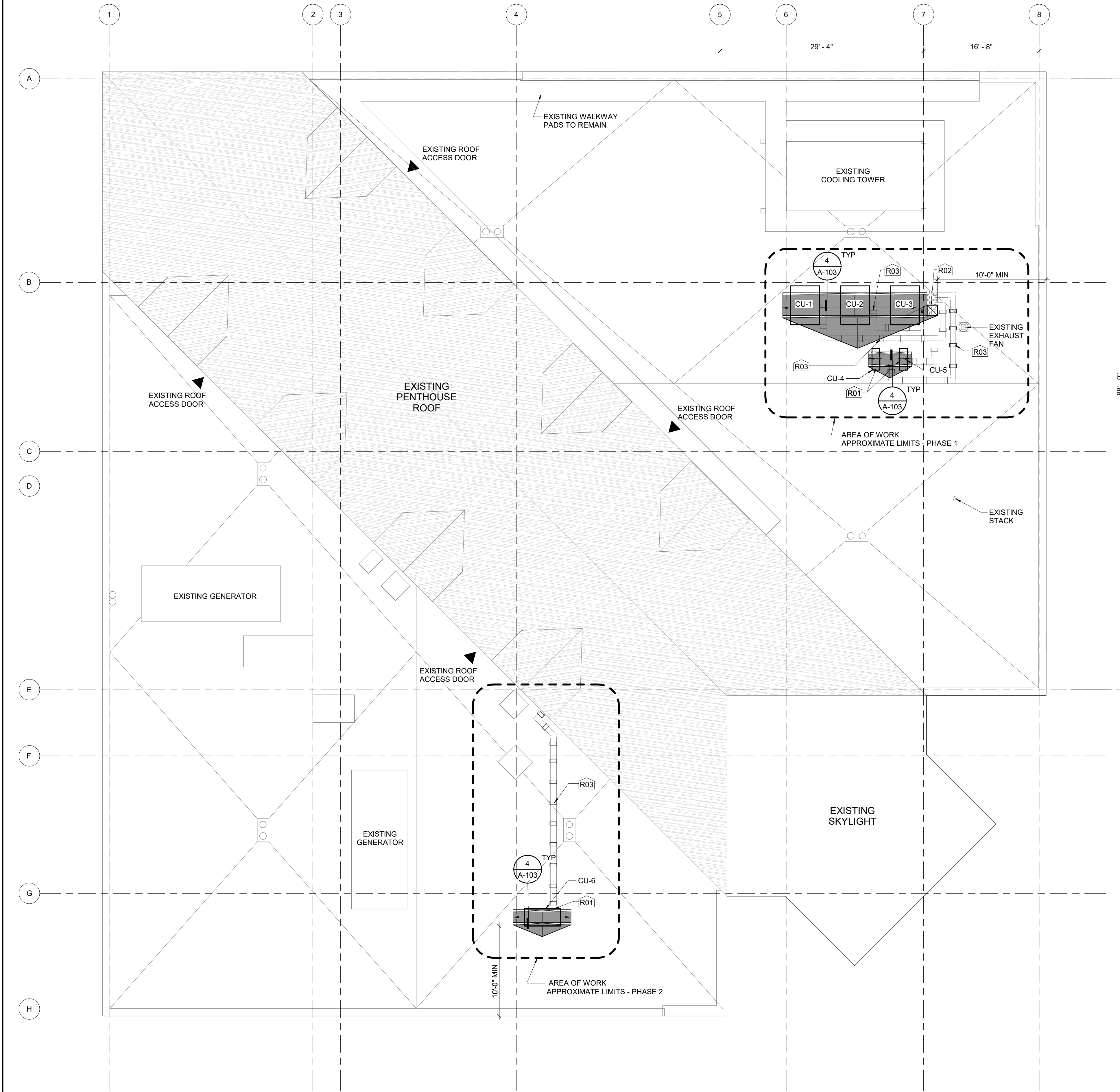
SHEET NO.



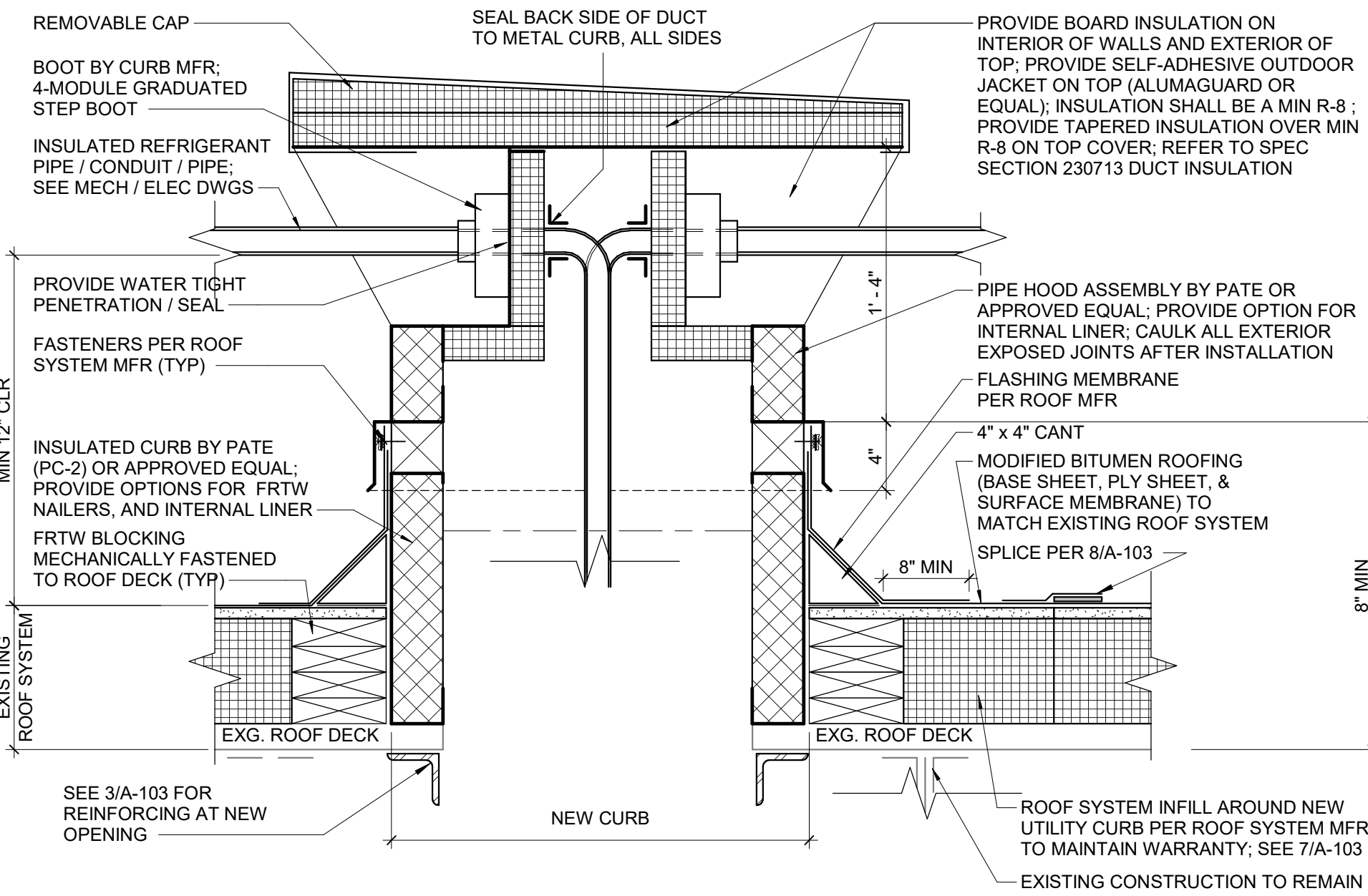
**KEY PLAN**

02/08/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION

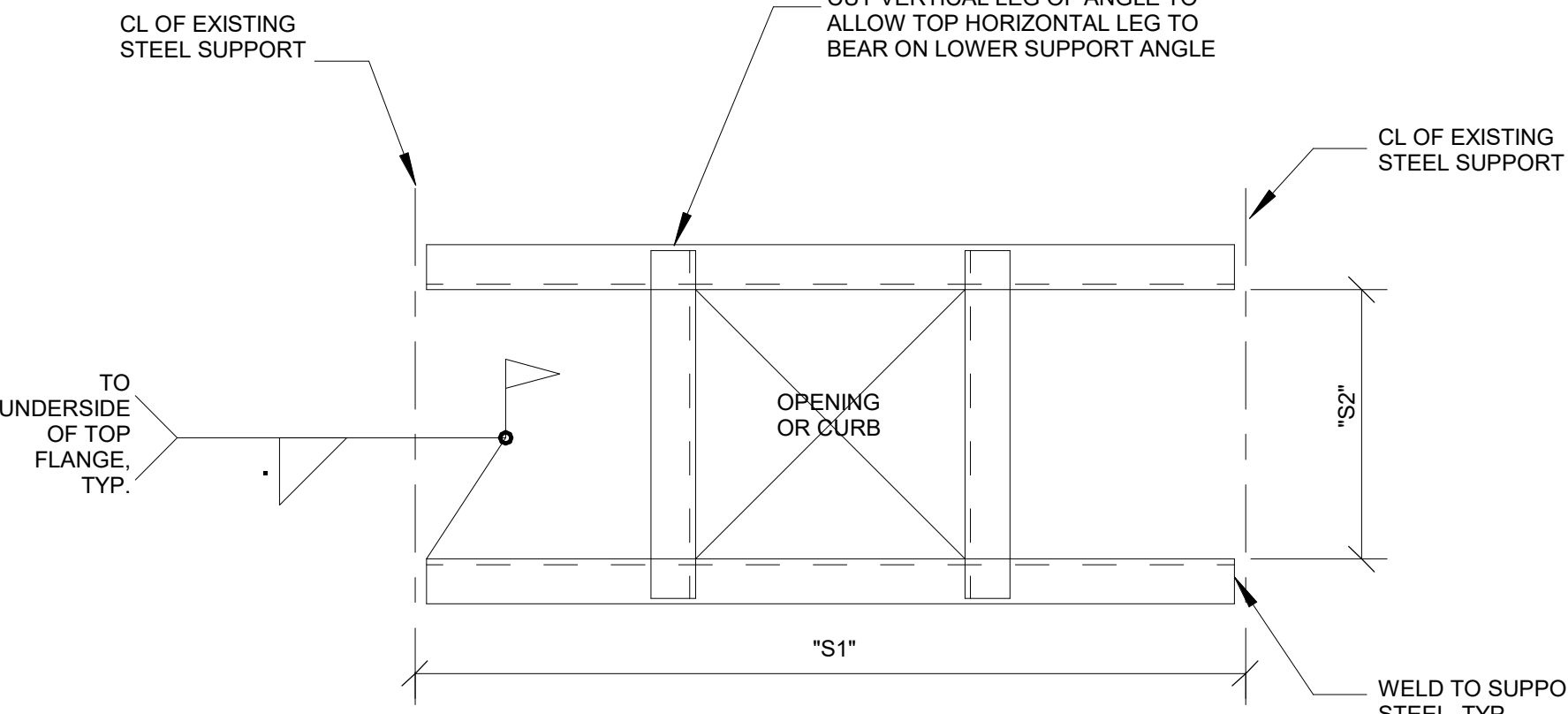




**1 ROOF PLAN FROEHLICH BUILDING**  
1/8" = 1'-0"

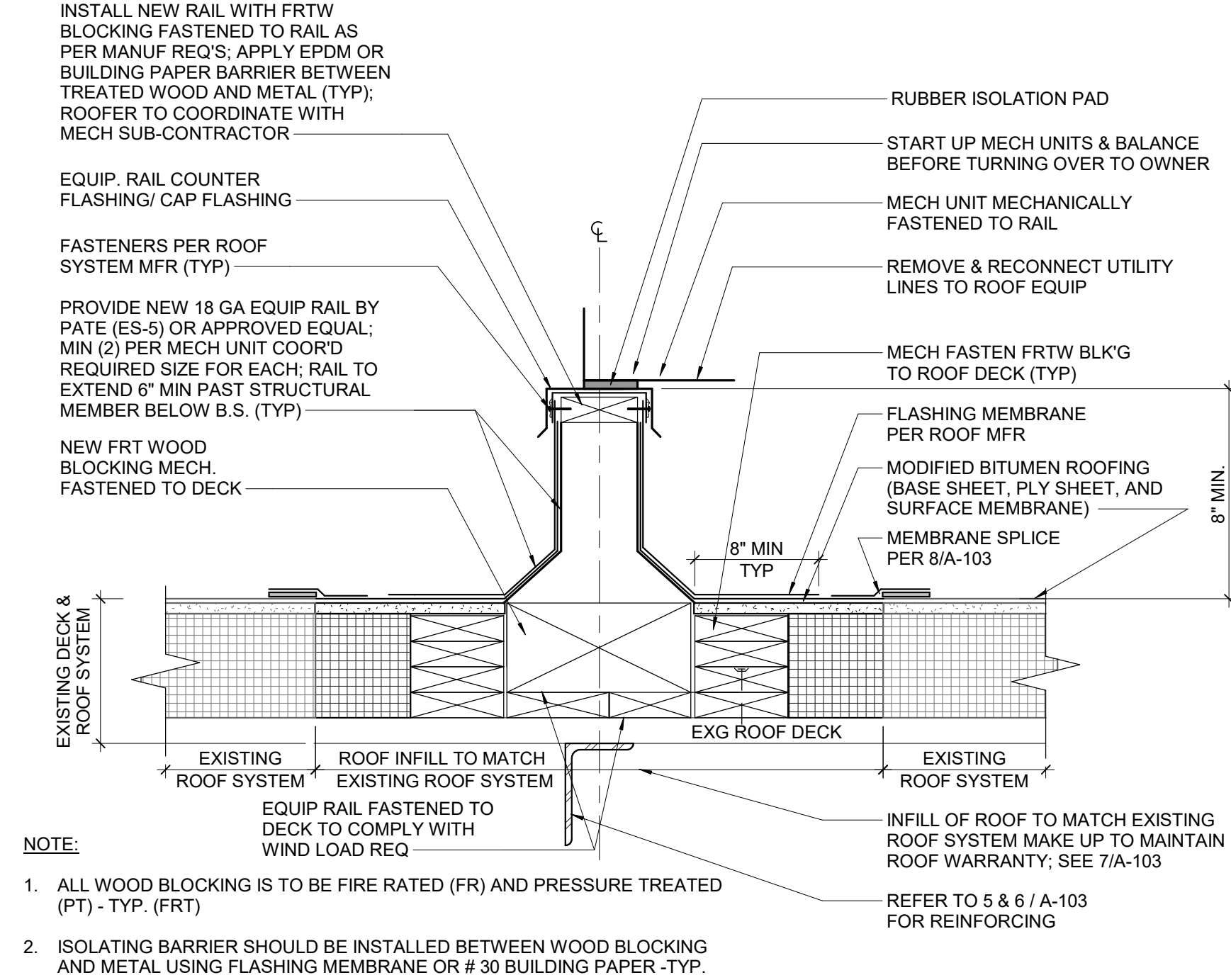


**2 TYP PIPE PENETRATION - NEW CURB & EXT**  
1 1/2" = 1'-0"

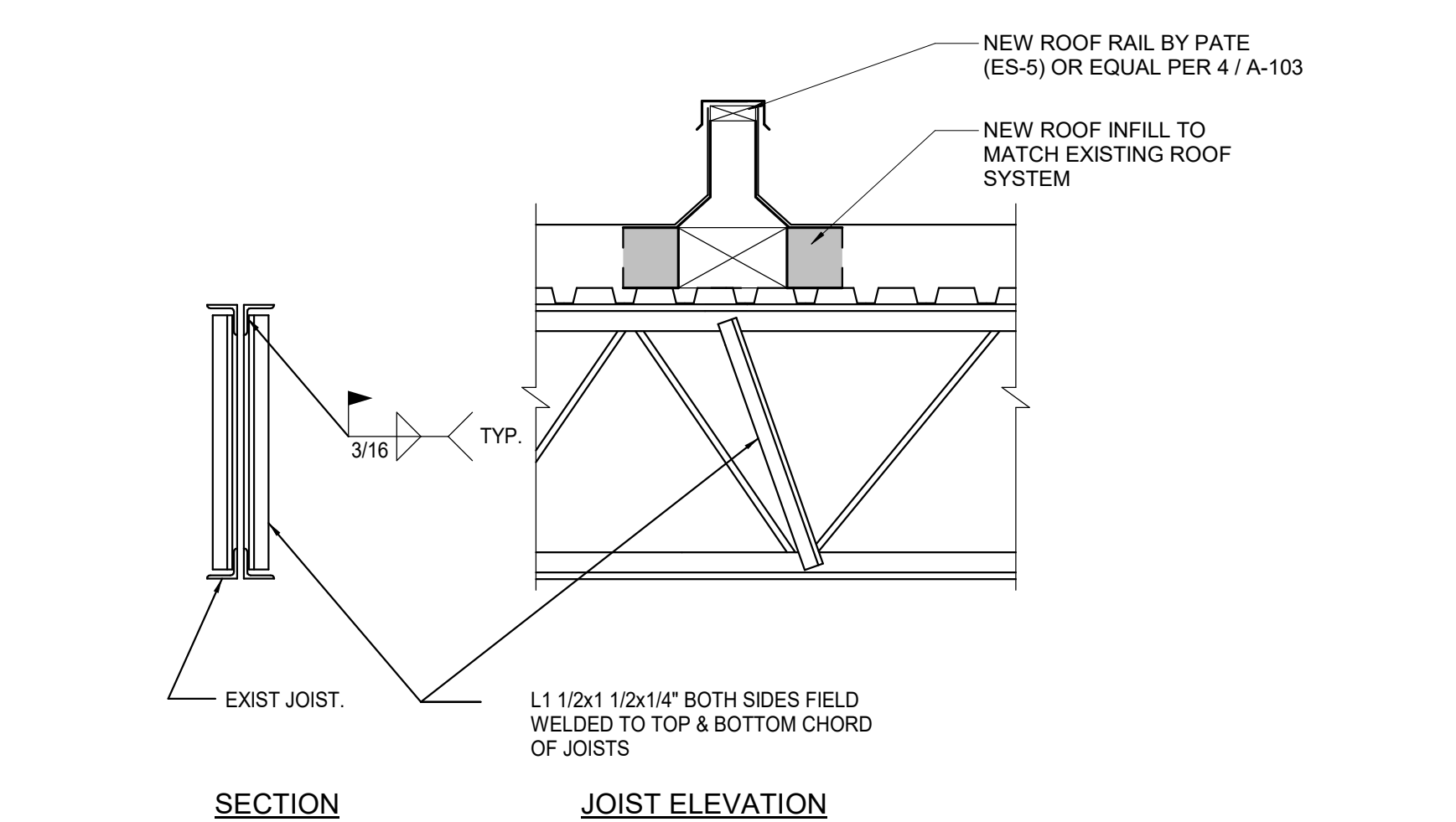


- NOTES:**
- FOR SIZE & LOCATION OF OPENINGS AND UNIT SIZES, SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.
  - CONTRACTOR SHALL VERIFY ALL OPENINGS AND EXACT LOCATIONS WITH THE TRADE CONTRACTOR REQUESTING SAID OPENING PRIOR TO FABRICATING & ERECTION OF STEEL FRAMES.
  - PROVIDE STEEL FRAMES AS SHOWN AROUND ALL REQUIRED OPENINGS LARGER THAN 8" ROOF.
  - PROVIDE STEEL ANGLES ON ALL SIDES OF OPENINGS UNLESS BEAM IS SHOWN ON PLAN, ANGLE SIZED TO BE:
    - A. FOR "S1" OR "S2" = 6" 6" L-4"x4"x5/16"
    - B. FOR "S1" OR "S2" = 6" 6" L-4"x4"x3/8"
  - PROVIDE STEEL ANGLES ON ALL SIDES OF MECHANICAL CURBS UNLESS BEAM IS SHOWN ON PLAN, ANGLE SIZES TO BE L-6"x6"x3/8".

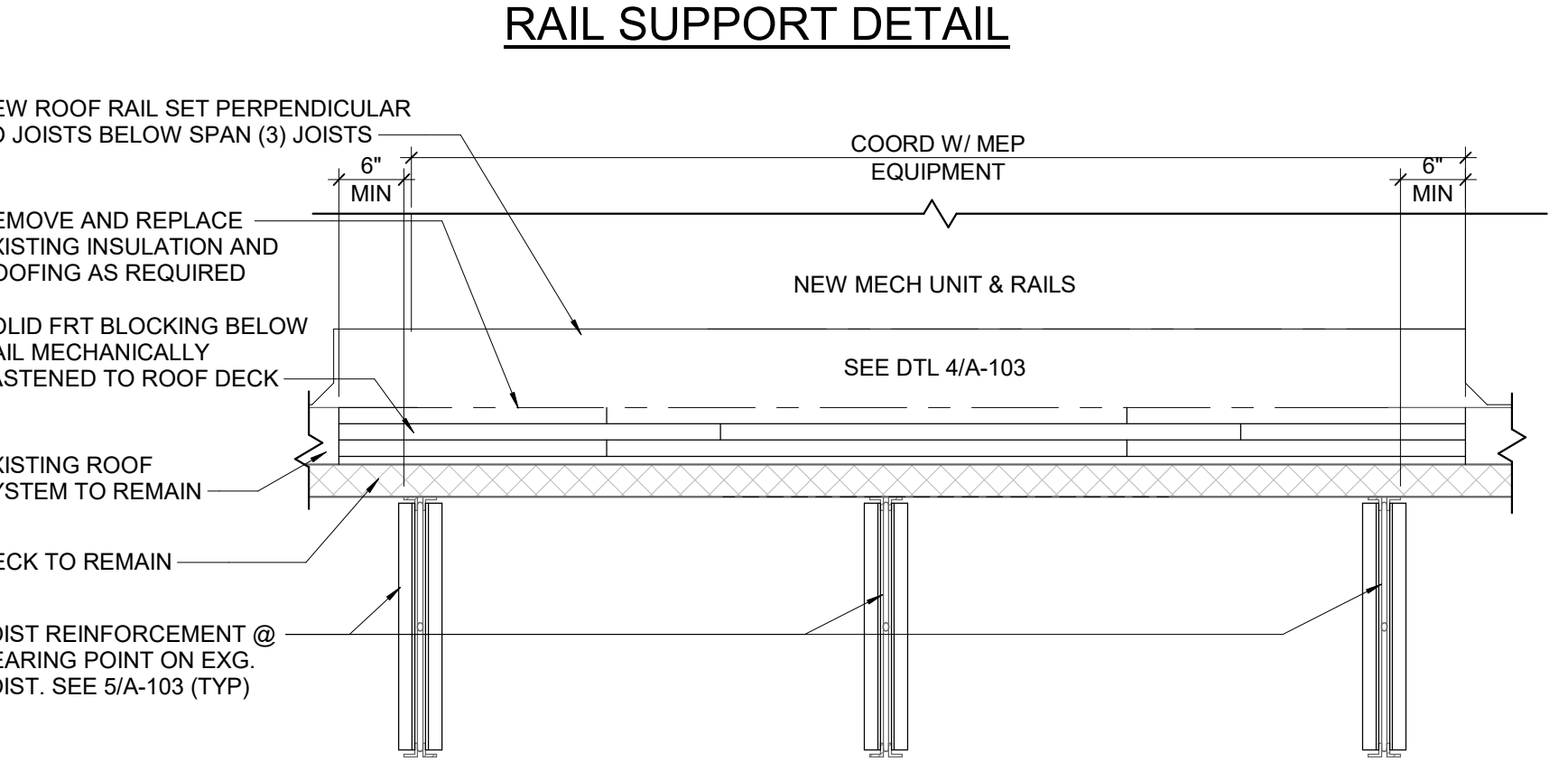
**3 CURB & RAIL REIN. DETAIL**  
3/4" = 1'-0"



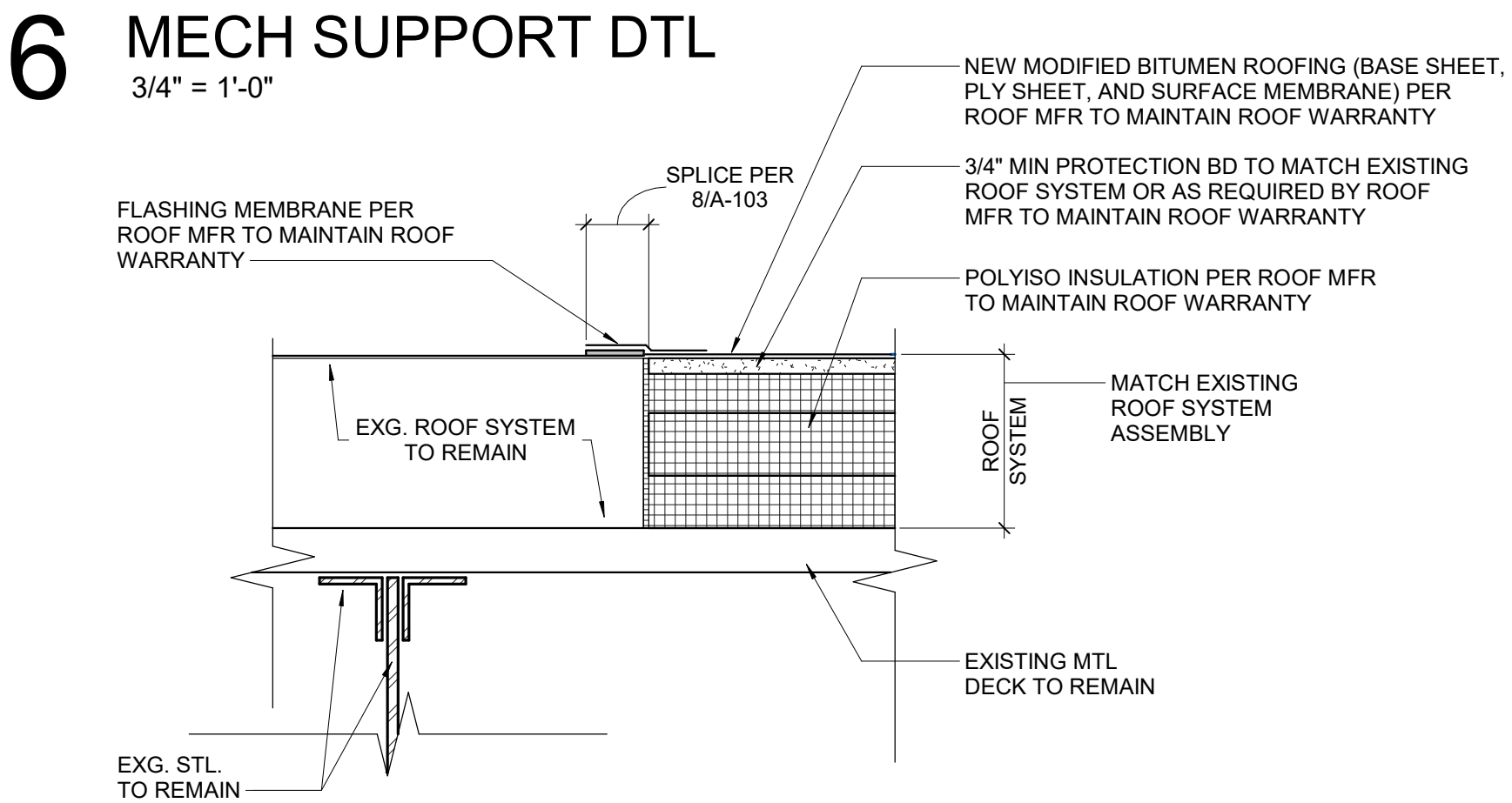
**4 TYP NEW EQUIPMENT RAIL DETAIL**  
1 1/2" = 1'-0"



**5 JOIST REINF DTL @ RAILS & CURBS ON MTL DECK**  
3/4" = 1'-0"



- NOTE:**
- CONTRACTOR TO PROVIDE STEEL SHOP DRAWINGS SHOWING LOCATIONS AND CONFIGURATIONS OF EXISTING STEEL AND PROPOSED STEEL MODIFICATIONS FOR NEW WORK.
  - IF CONDITIONS VARY FROM THOSE SHOWN (STEEL LOCATIONS, HVAC UNIT SIZE, SHAPE OR WEIGHTS, CURB SIZE AND WEIGHTS) THEN THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS WITH SIGNED AND SEALED ENGINEER CALCULATIONS JUSTIFYING STRUCTURAL MODIFICATIONS WITH UNIT SIZES, CURB WEIGHTS, AND LOADING. THIS INCLUDES SEISMIC, WIND LOADING, AND FASTENING REQUIREMENTS FOR STEEL AND HVAC UNIT CONNECTIONS TO CURBS AND STEEL.
  - ALL STRUCTURAL STEEL SHALL RECEIVE A SHOP COAT OF PAINT EXCEPT CONTACT SURFACES WITHIN 4 INCHES OF FIELD WELDS & STEEL TO BE FIREPROOFED (AS REQUIRED).

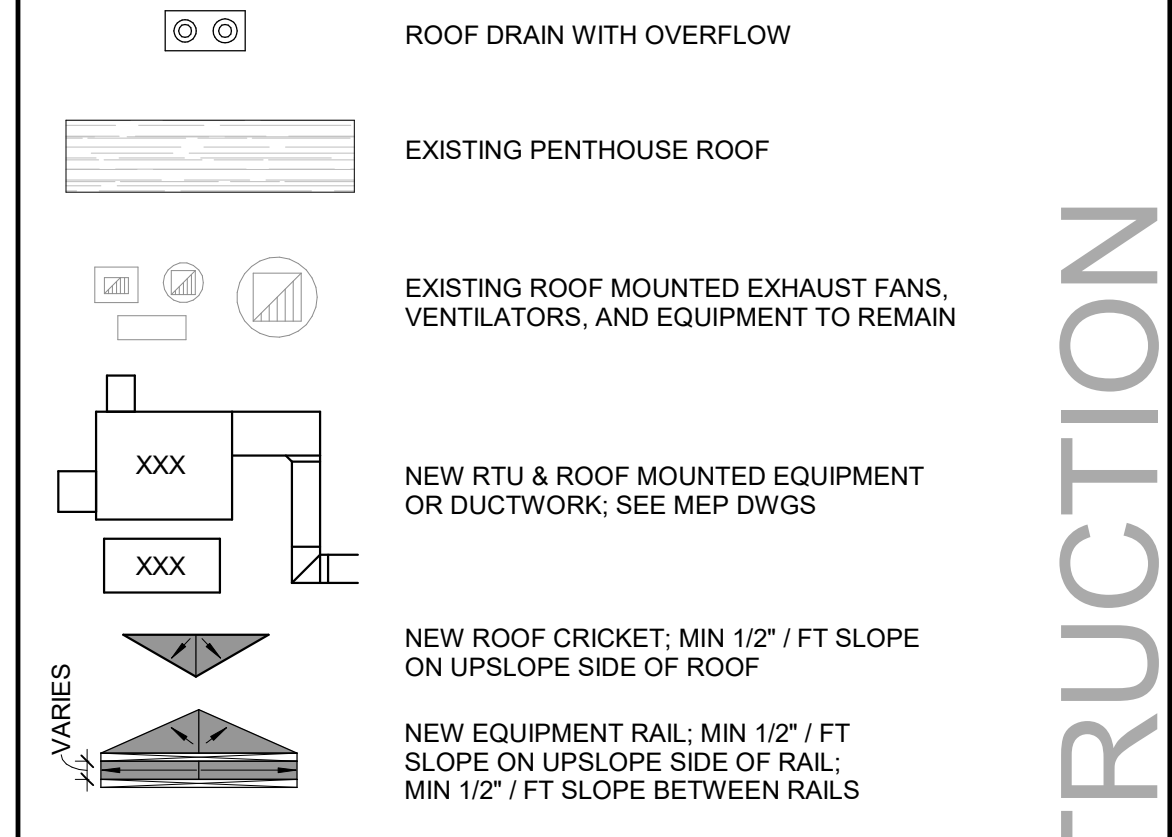


**7 ROOF INFILL DETAIL**  
1 1/2" = 1'-0"

**ROOF NOTES**

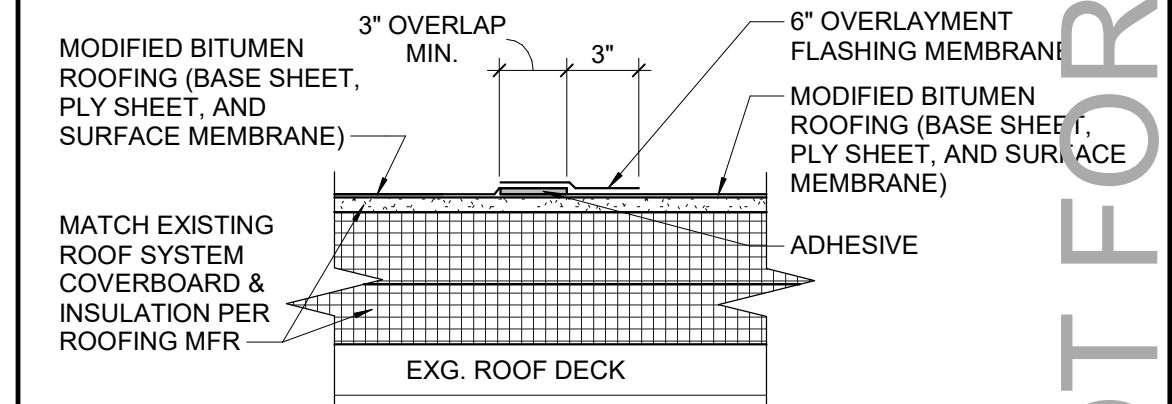
- ALL PENETRATION SURFACE MUST BE CLEAN AND FREE OF ALL RUST AND OTHER CONTAMINANTS. IN ADDITION TO WIPING W/SURFACE CONDITIONER FOR PROPER ADHESION OF ROOFING MEMBRANE.
- COORDINATE ALL ROOF WORK WITH THE EXISTING ROOF SYSTEM MANUFACTURERS STANDARD DETAILS AND ROOF WARRANTY CURRENTLY IN PLACE. WARRANTY NUMBER GEM42388-1003 BY ROOF MFR GAF. AT CONCLUSION OF ROOF SYSTEM WORK OBTAIN A ROOF SYSTEM INSPECTION (INCLUDING PAYMENT OF THE INSPECTION FEES) AND WRITTEN REPORT FROM THE ROOF MANUFACTURER AND UPDATE THE ROOF WARRANTY TO REFLECT ALL WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE ROOF MANUFACTURERS WARRANTY AND STANDARD DETAIL REQUIREMENTS. MAKE ANY AND ALL REPAIRS REQUIRED BY THE ROOF MANUFACTURER TO SECURE AN UPDATED ROOF SYSTEM WARRANTY IN WRITING AT THE CONCLUSION OF WORK.
- COORDINATE INSPECTION SO ARCHITECT AND OWNER ARE IN ATTENDANCE.
- PROVIDE A COPY OF THE INSPECTION REPORT DIRECTLY TO THE ARCHITECT FOR REVIEW AND COMMENT.
- INSPECTION SHALL INCLUDE AN INITIAL INSPECTION TO INSPECT THE WORK AND A FOLLOW UP INSPECTION IF REQUIRED TO REVIEW SUBSEQUENT REPAIRS THAT MAY BE REQUIRED.
- CONTRACTOR SHALL OBTAIN AND SUBMIT A WARRANTY MODIFICATION OR RIDER TO THE ORIGINAL WARRANTY. SUBMIT WARRANTY REVISION/ RIDER TO THE ARCHITECT FOR REVIEW. FINAL APPROVED DOCUMENT SHALL BE INCORPORATED INTO THE CLOSEOUT DOCUMENTS AND FINAL WARRANTY.
- ROOF MANUFACTURER SHALL PERFORM A ROOF INSPECTION OF THE ENTIRE ROOF AREA AND PROVIDE A REPORT OUTLINING THE EXISTING ROOF REPAIRS THAT ARE SUGGESTED FOR THE EXISTING ROOF. CONTRACTOR SHALL INCLUDE COST OF THE INSPECTION AS PART OF THE BID.
- CONTRACTOR SHALL PAY ALL FEES FOR INSPECTIONS AND WARRANTY UPDATES/ RIDERS REQUIRED AS PART OF THEIR BID.

**ROOF PLAN LEGEND**

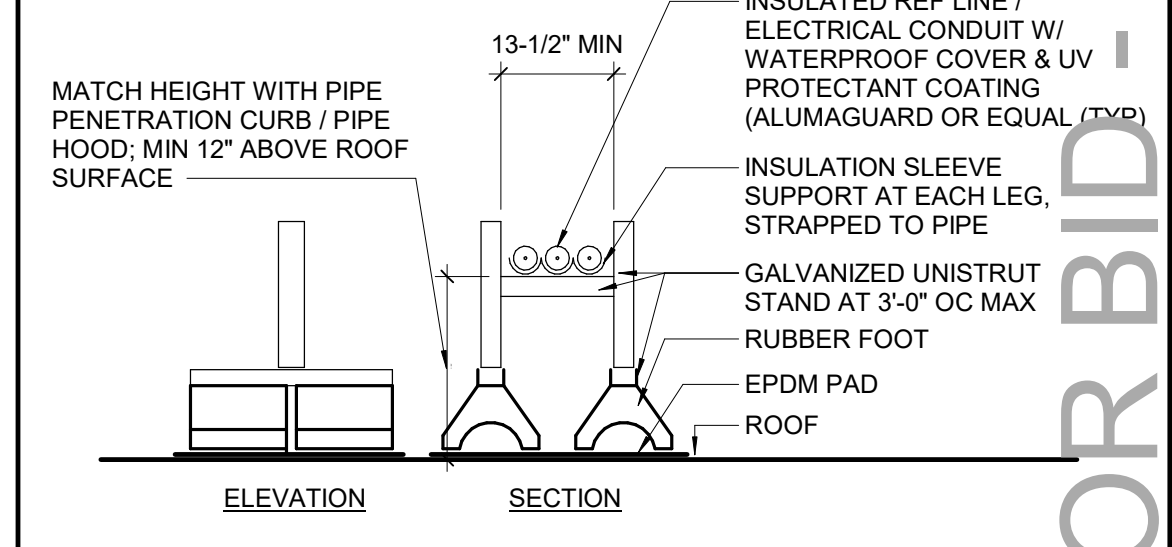


**ROOF TAG NOTES**

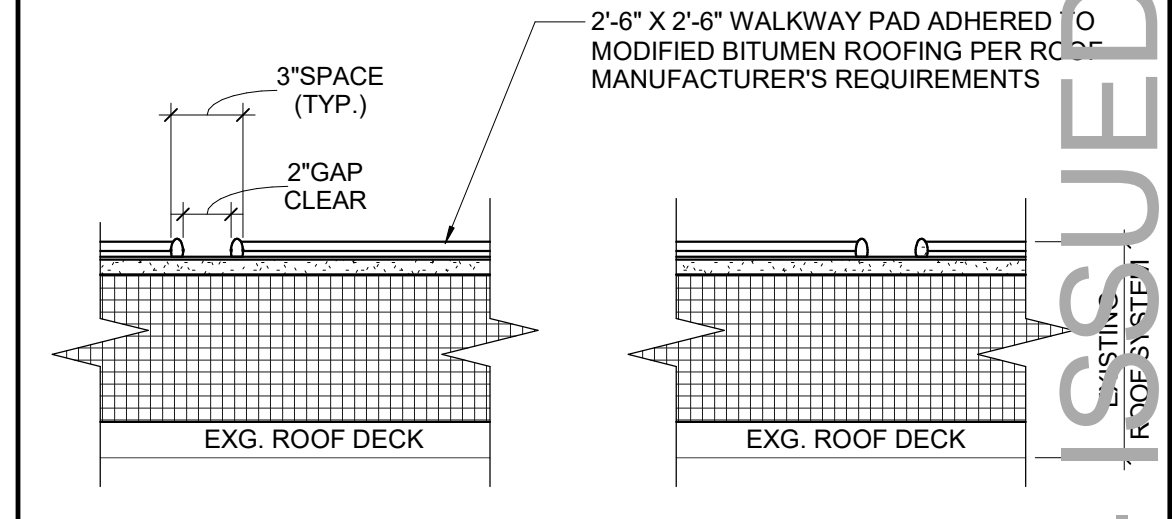
- R01 NEW MECH EQUIPMENT PER MEP DWGS ON RAILS. INSTALL NEW 1/2" CRICKET ON UPSLOPE SIDE OF UNIT & PATCH ROOF TO MATCH EXISTING ADJACENT ROOF SYSTEM. INSTALL 1/2" TAPERED CRICKET BETWEEN RAILS WITH HIGH POINT AT CENTER. NEW EQUIPMENT / RAIL INSTALLATION IS NOT TO IMPEDE EXISTING ROOF DRAINAGE.
- R02 INSTALL A NEW ROOF CURB AND OPENING IN EXISTING ROOF SYSTEM AND ROOF DECK FOR PIPE PENETRATIONS. INSTALL 1/2" / FT TAPERED CRICKET ON UPSLOPE SLOPE AS REQUIRED. SEE DETAIL 2/A-103.
- R03 NEW REFRIGERANT SUPPORT LEGS @ 3'-0" MAX. SEE DETAIL 9/A-103.



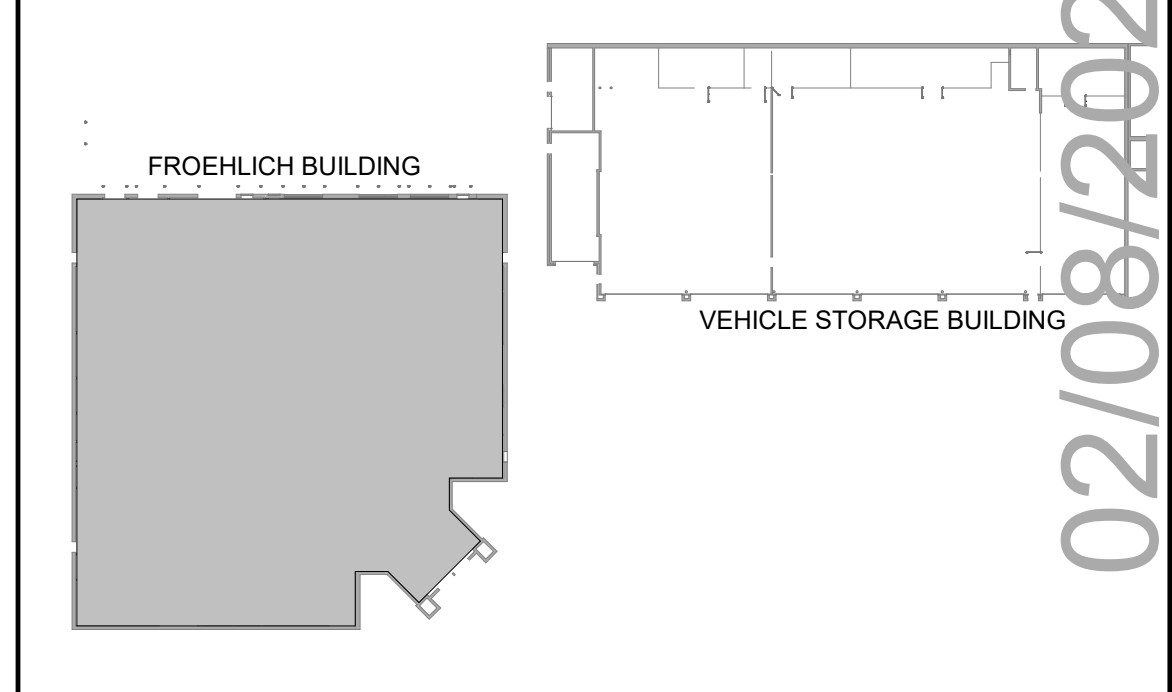
**8 TYP LAP SPlice**  
1 1/2" = 1'-0"



**9 PIPE SUPPORT**  
1" = 1'-0"



**10 TYP WALKWAY PAD DETAIL**  
1 1/2" = 1'-0"

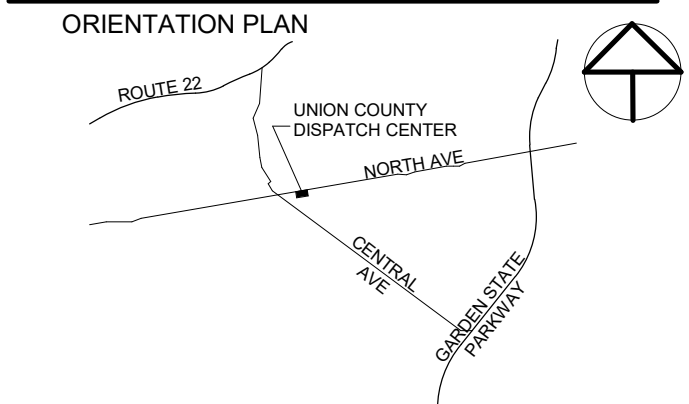


**KEY PLAN**

ISS / REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

CLIENT

CONSULTANT



PAULUS SOKOLOWSKI and SARTOR ENGINEERING, PC  
67A MOUNTAIN BOULEVARD EXTENSION  
P.O. Box 4029  
WARREN, NEW JERSEY 07059  
TEL: 732.560.9700

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**Harry T. Osborne**  
Registered Architect - New York  
License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**County of Union**

PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROEHLICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

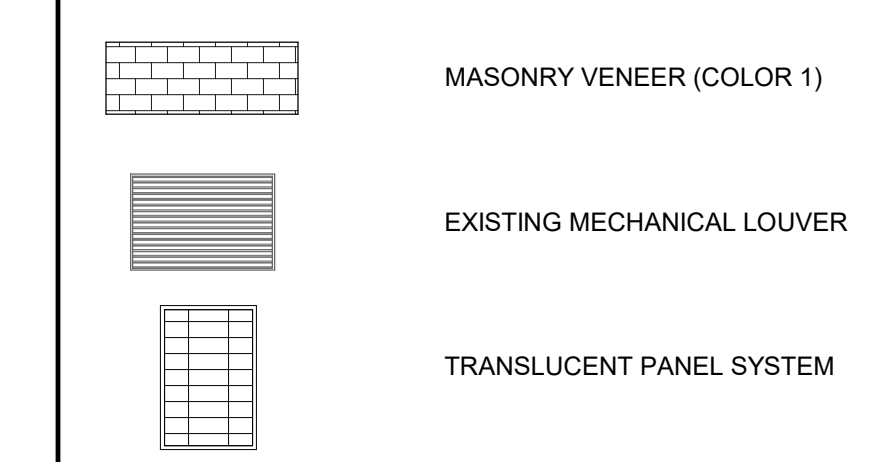
SHEET NAME  
**ROOF PLAN**

JOB NO.: 03080002  
DATE: 04/28/2020  
DRAWN: JRF/IMY  
CHECK: JMG  
SCALE: As Indicated  
SHEET NO.

02/08/2021 ISSUED FOR BID - NOT FOR CONSTRUCTION



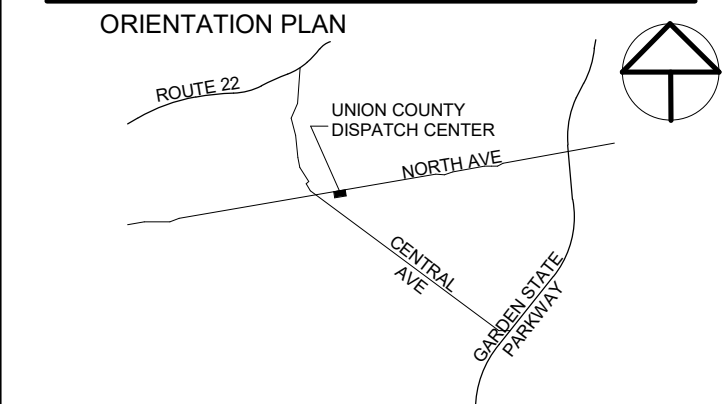
**ELEVATION MATERIALS LEGEND**



ISS / REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1
2	03/17/21	ISSUED FOR BID REV2

CLIENT

CONSULTANT



PAULUS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
 P.O. Box 4059  
 WARREN, NEW JERSEY 07059  
 TEL: 732.560.9700

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**Harry T. Osborne**  
 Registered Architect - New York  
 License No. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**County of Union**



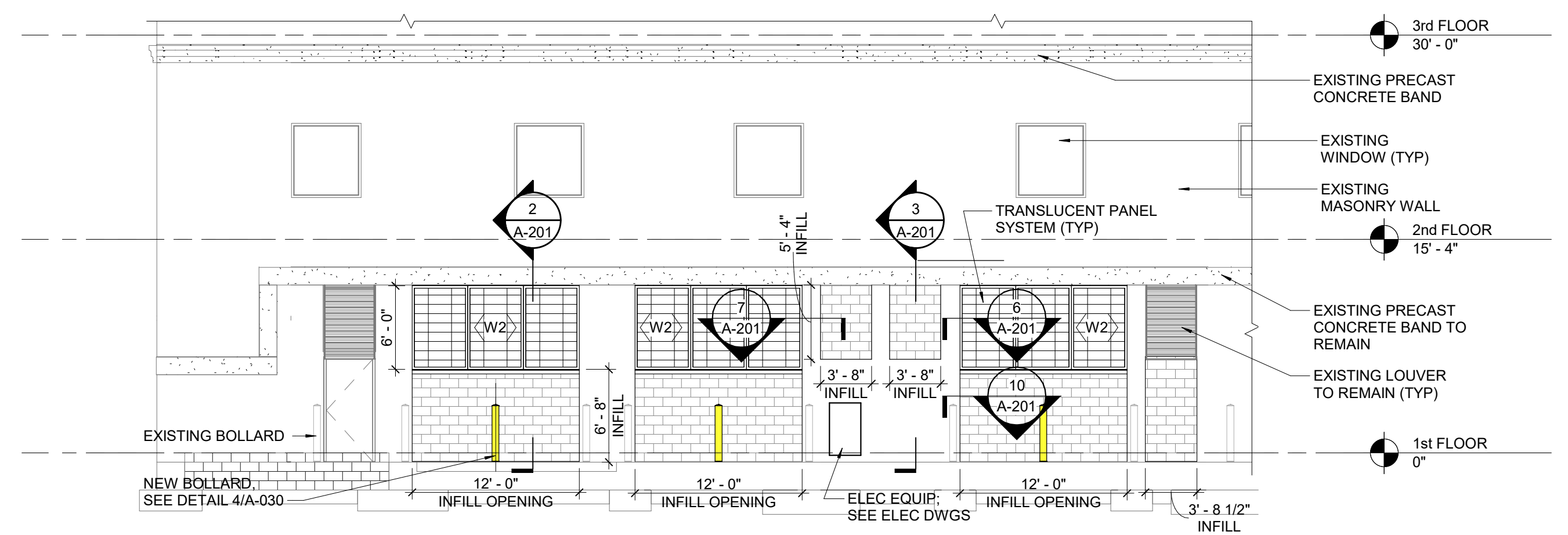
PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**  
 FROELICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME  
**BUILDING ELEVATION, WALL SECTION AND DETAILS**

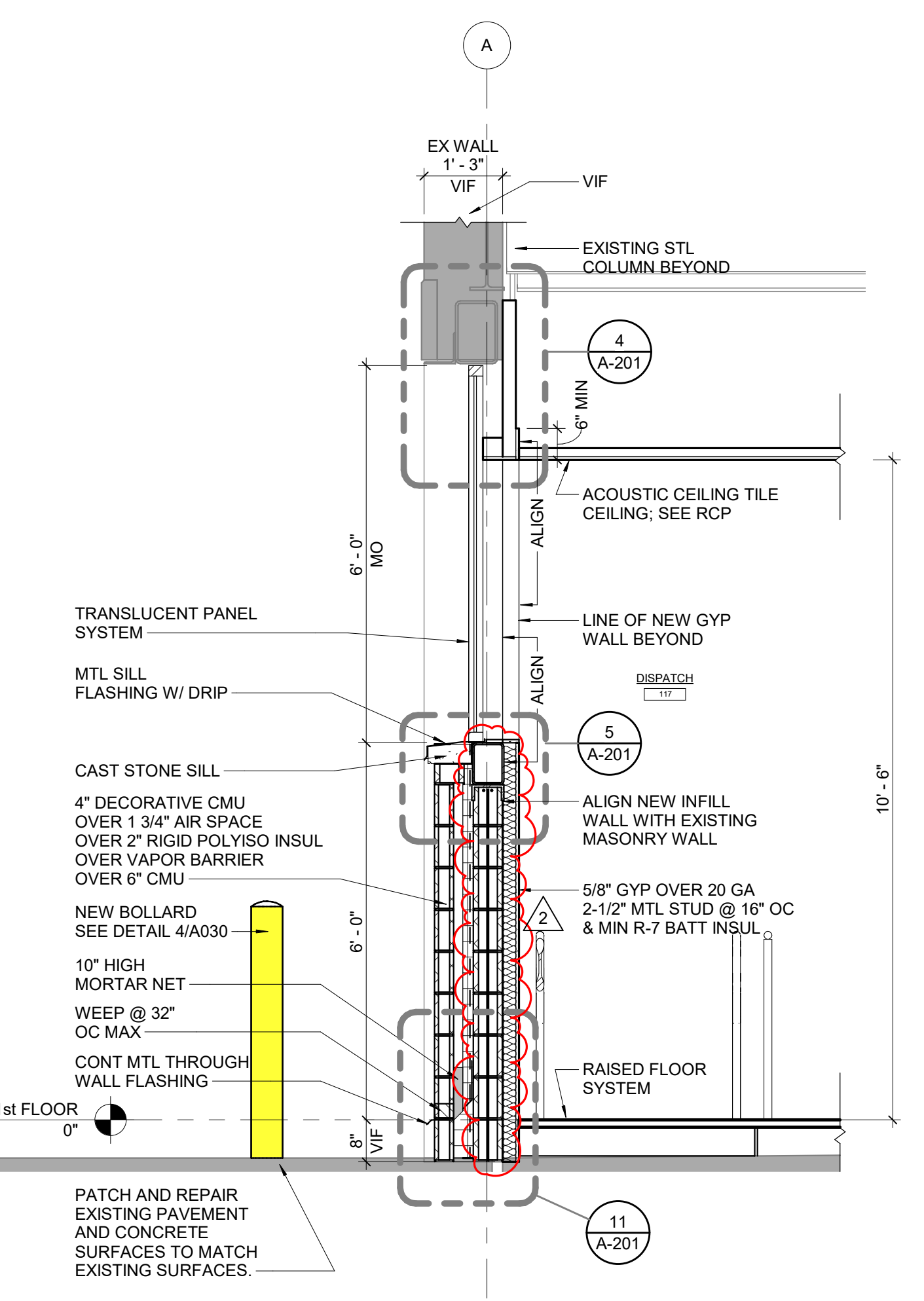
JOB NO.: 03009002  
 DATE: 04/28/2020  
 DRAWN: JRF  
 CHECK: JMG  
 SCALE: As Indicated

SHEET NO.

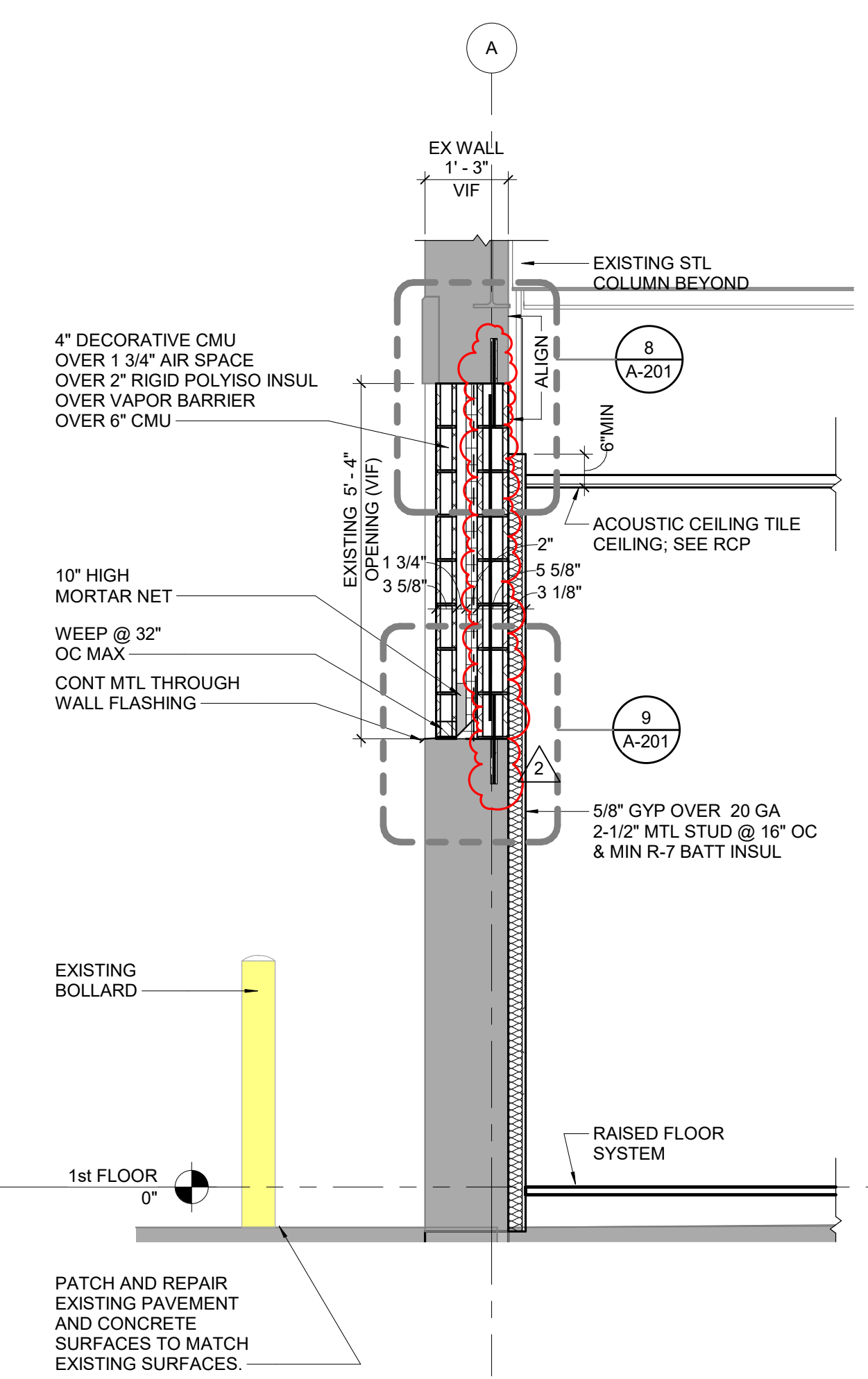
**A-201**



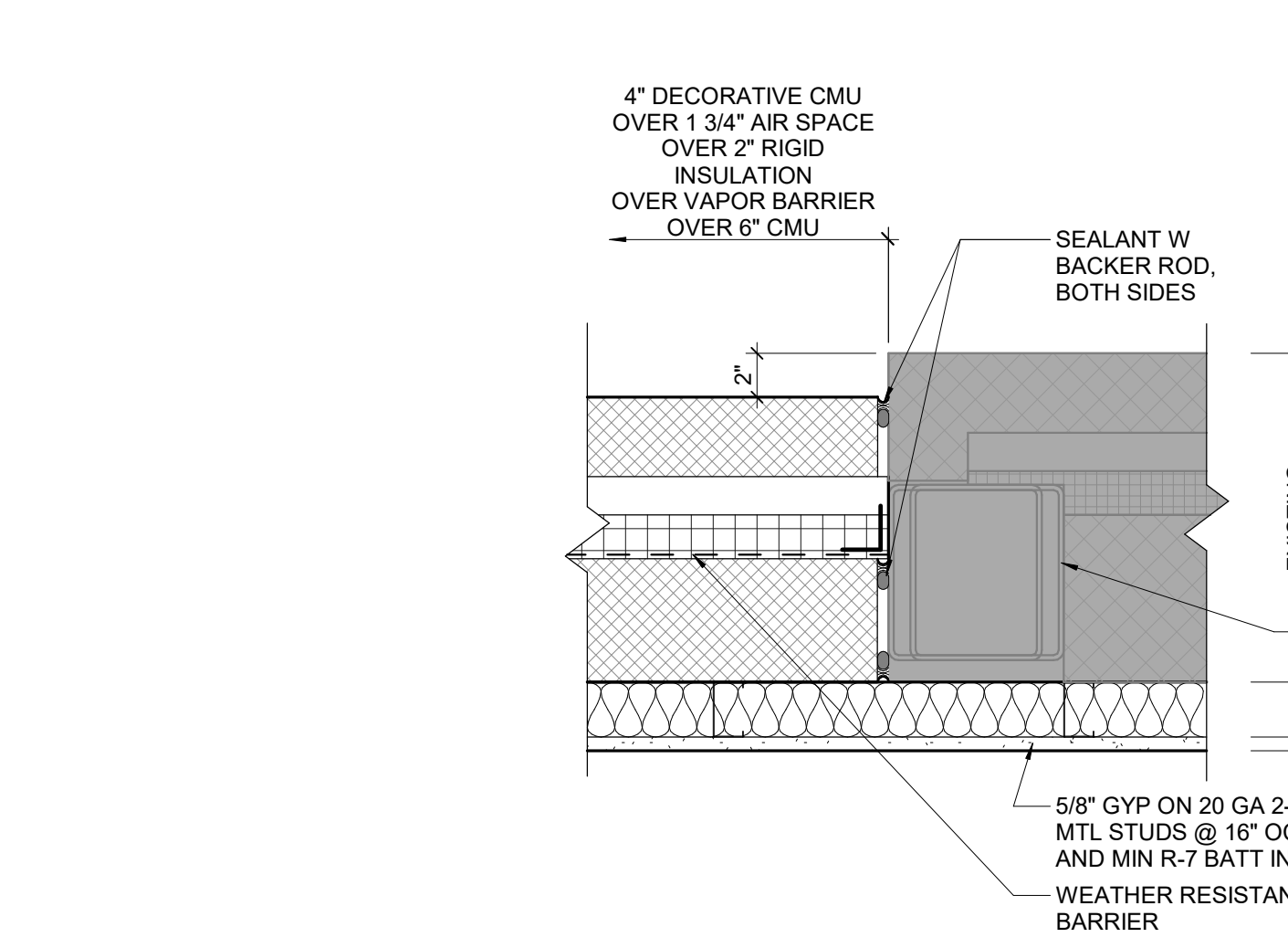
**1 PARTIAL REAR ELEVATION**  
 1/8" = 1'-0"



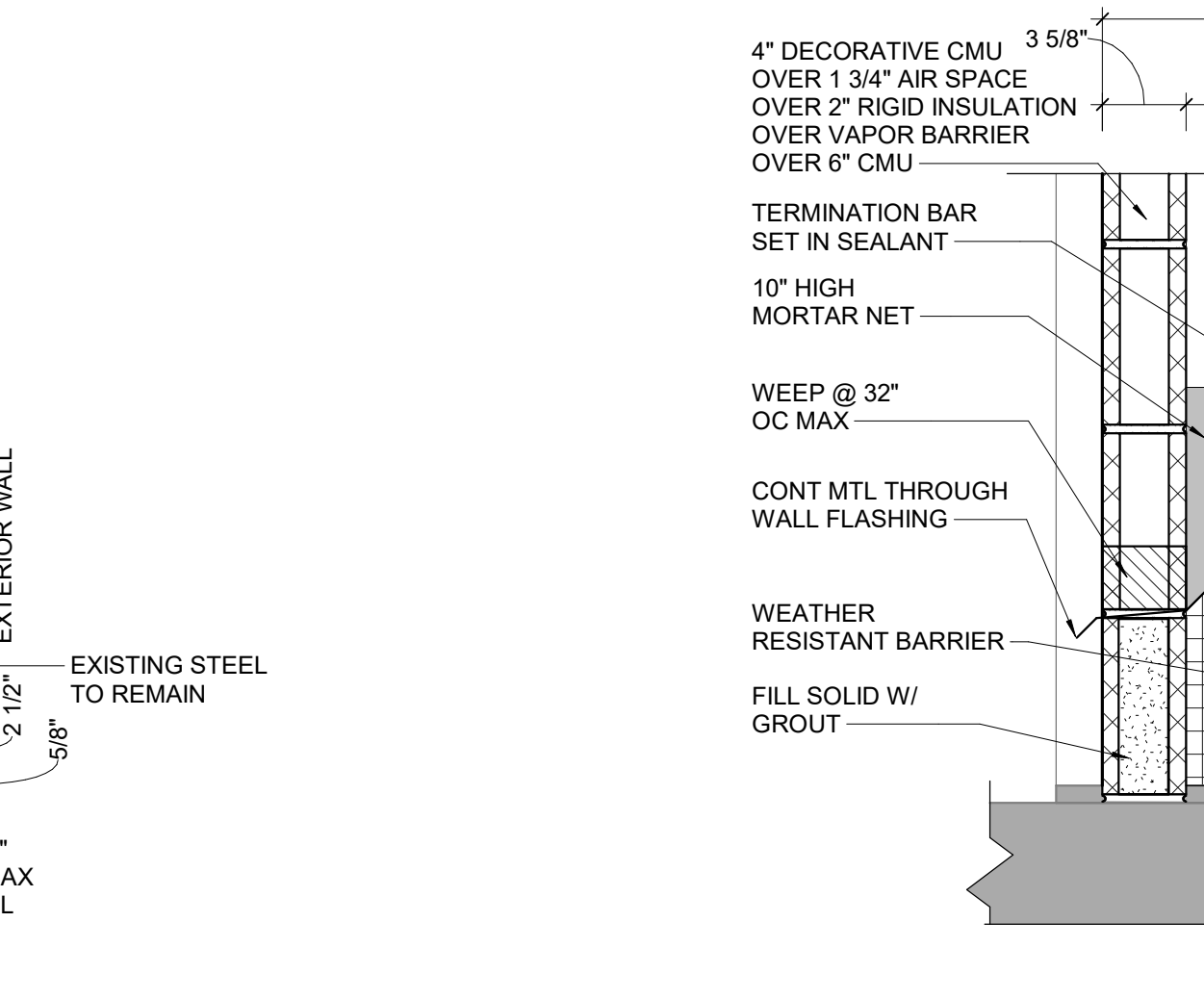
**2 INFILL WALL SECTION**  
 1/2" = 1'-0"



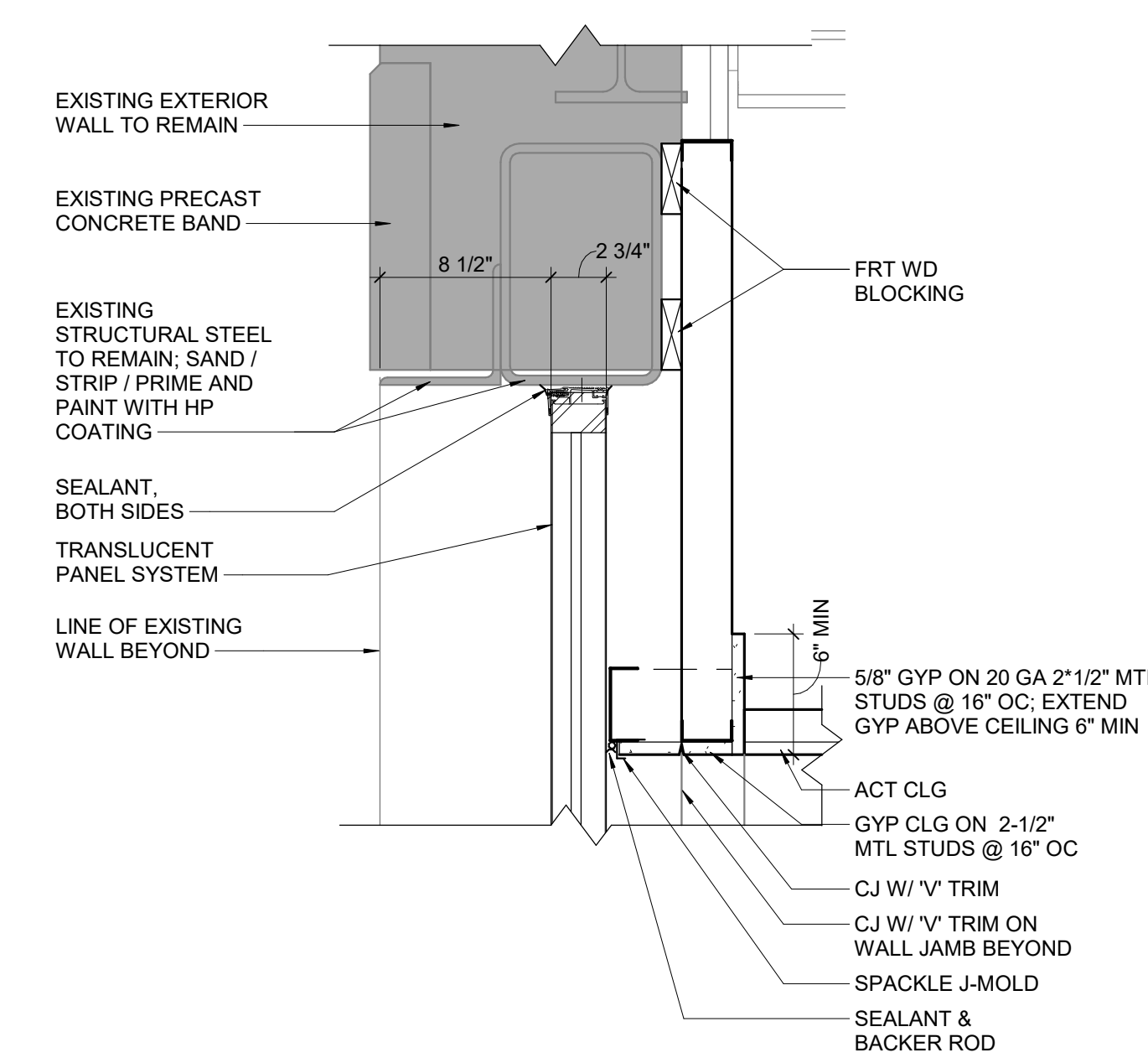
**3 INFILL WALL SECTION**  
 1/2" = 1'-0"



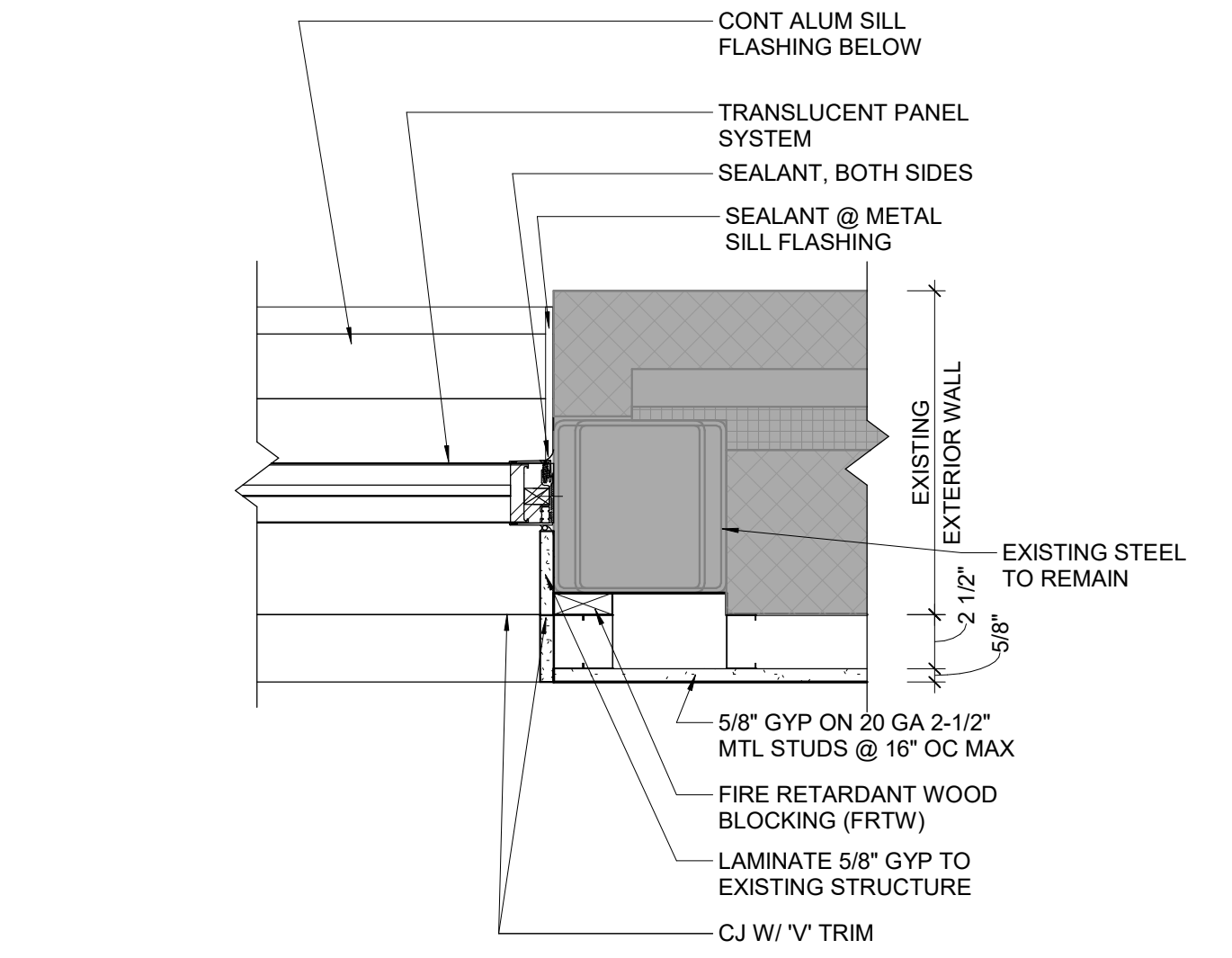
**10 WALL INFILL @ GARAGE - JAMB DTL**  
 1 1/2" = 1'-0"



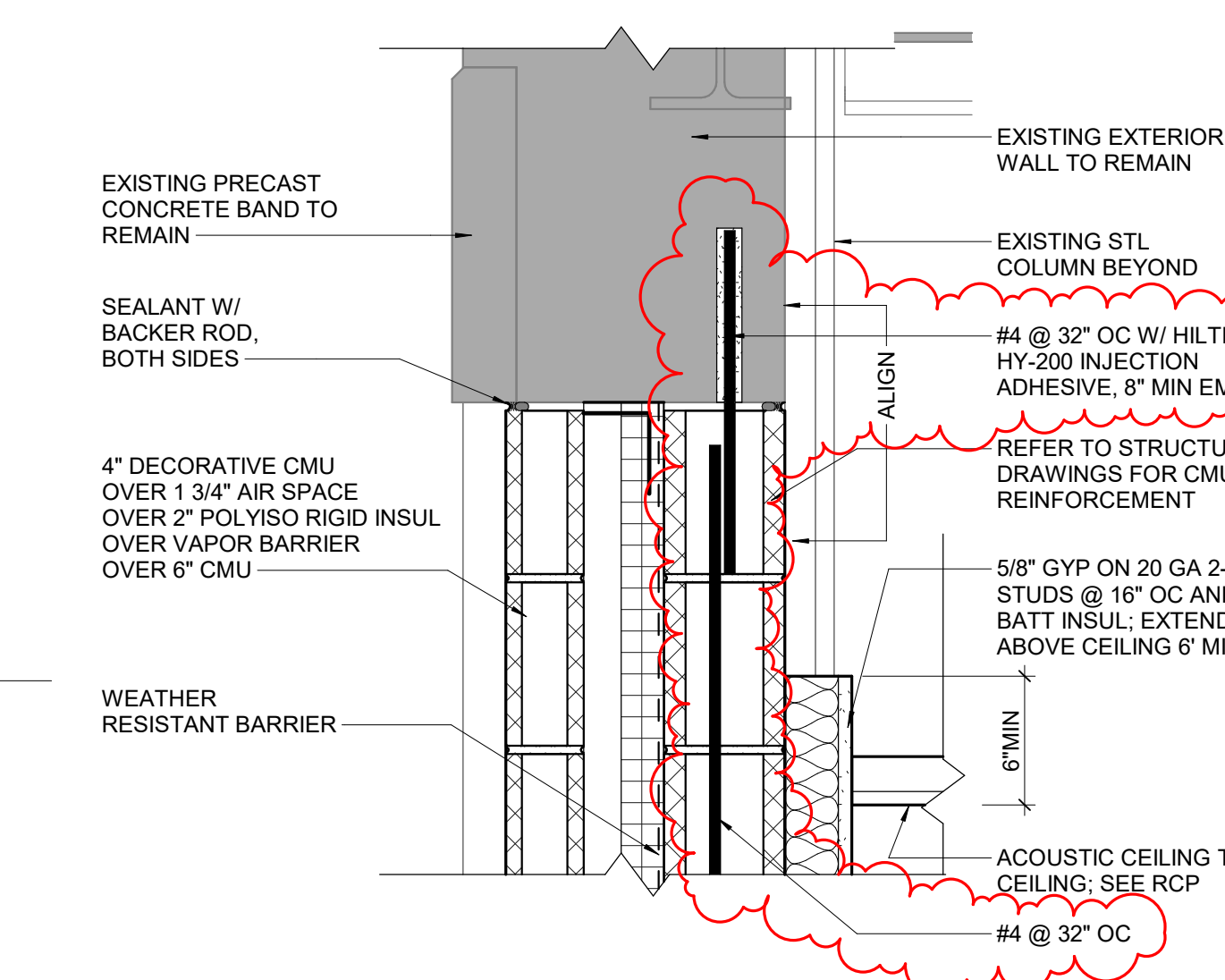
**11 INFILL WALL - SILL DTL**  
 1 1/2" = 1'-0"



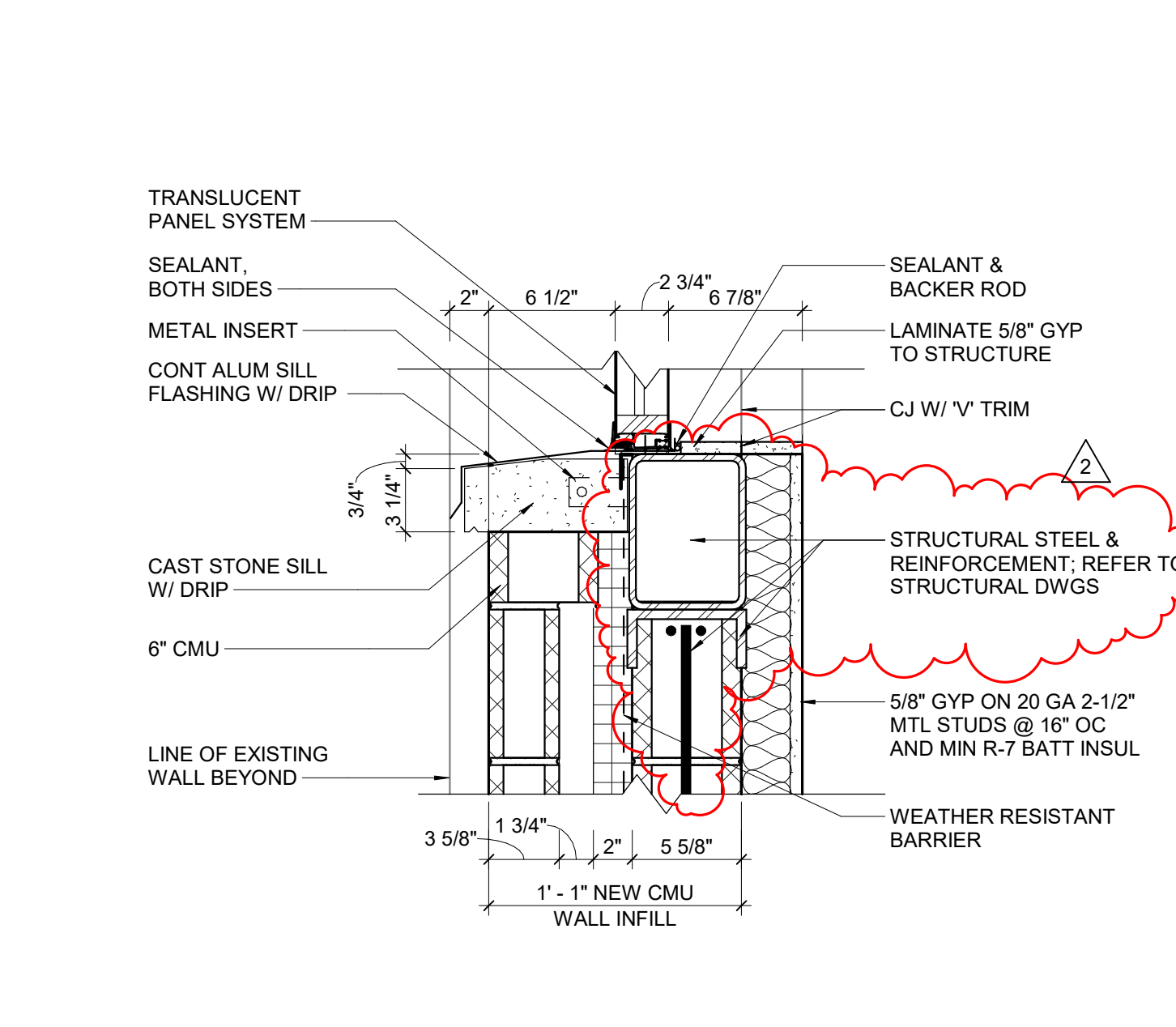
**4 TRANS PANEL - HEAD DTL**  
 1 1/2" = 1'-0"



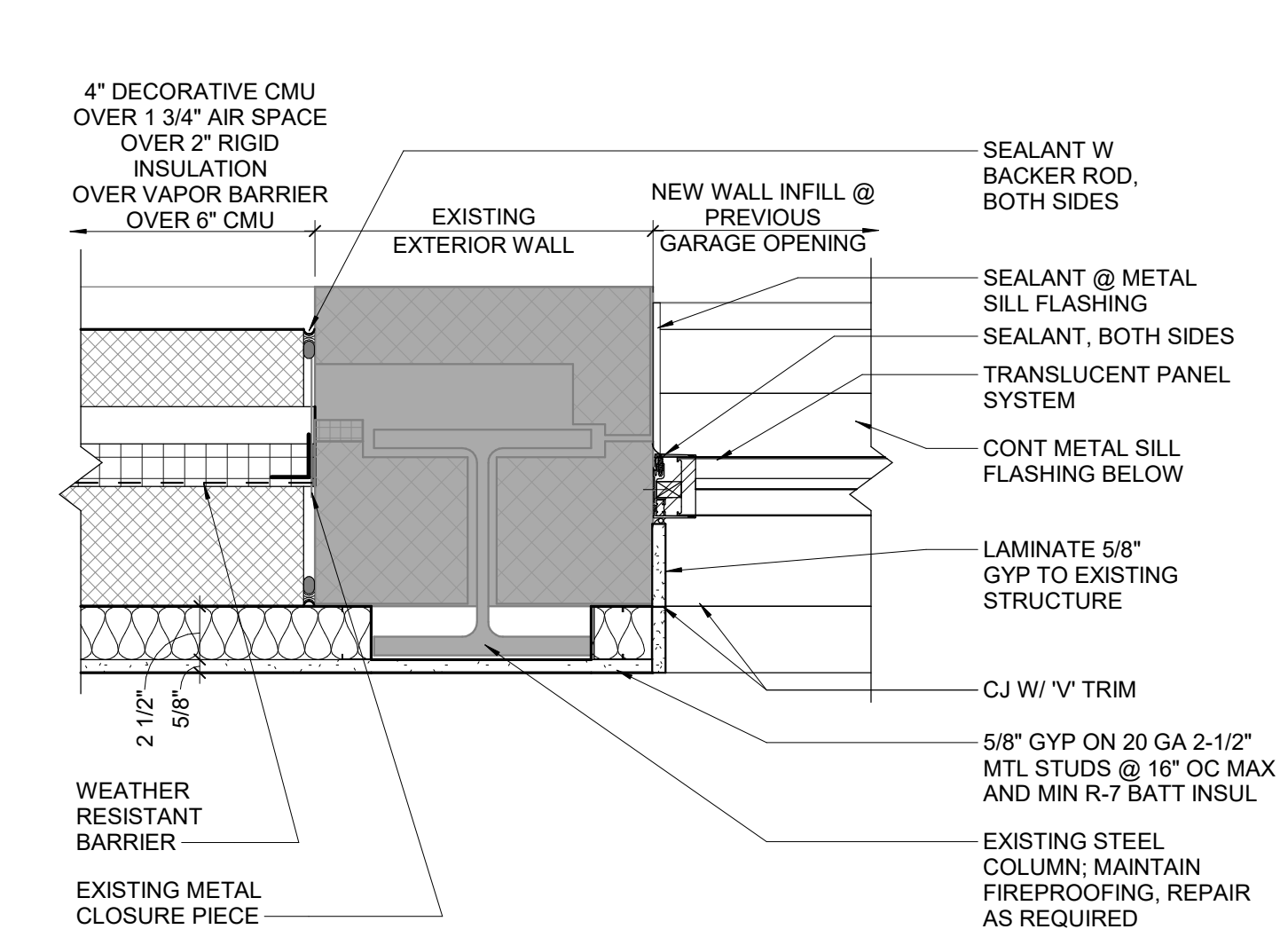
**6 TRANS PANEL - JAMB DTL**  
 1 1/2" = 1'-0"



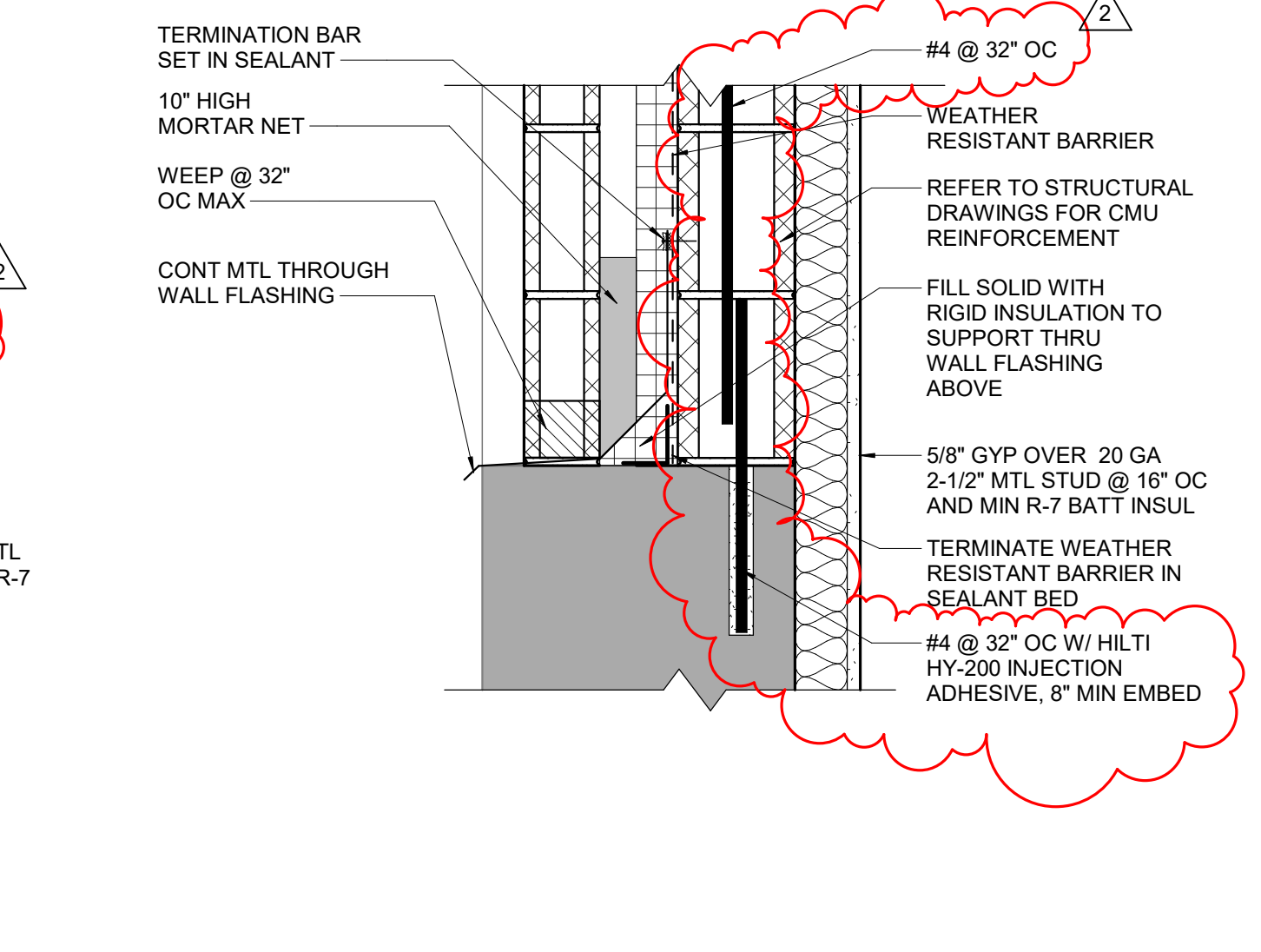
**8 INFILL WALL - HEAD DTL**  
 1 1/2" = 1'-0"



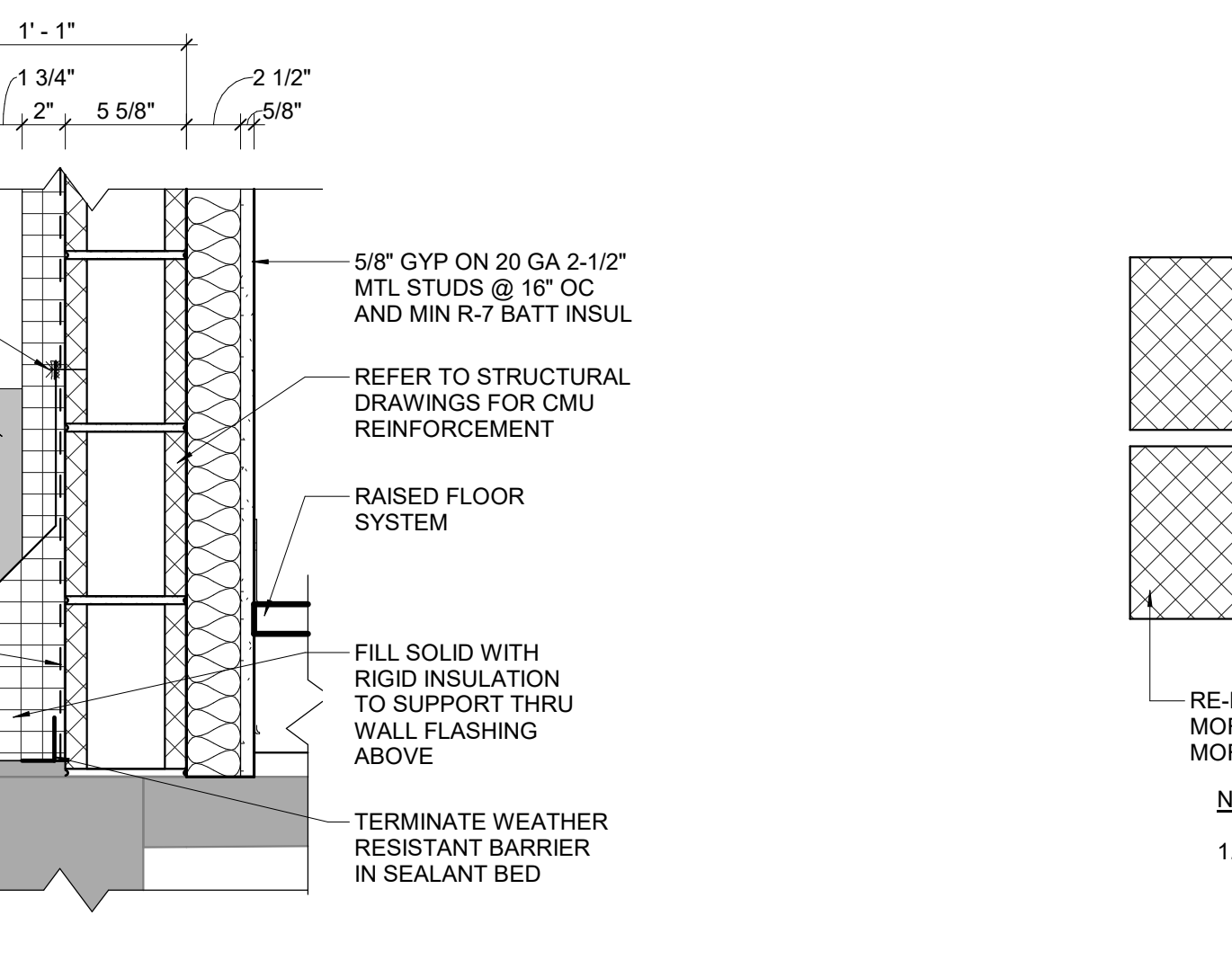
**5 TRANS PANEL - SILL DTL**  
 1 1/2" = 1'-0"



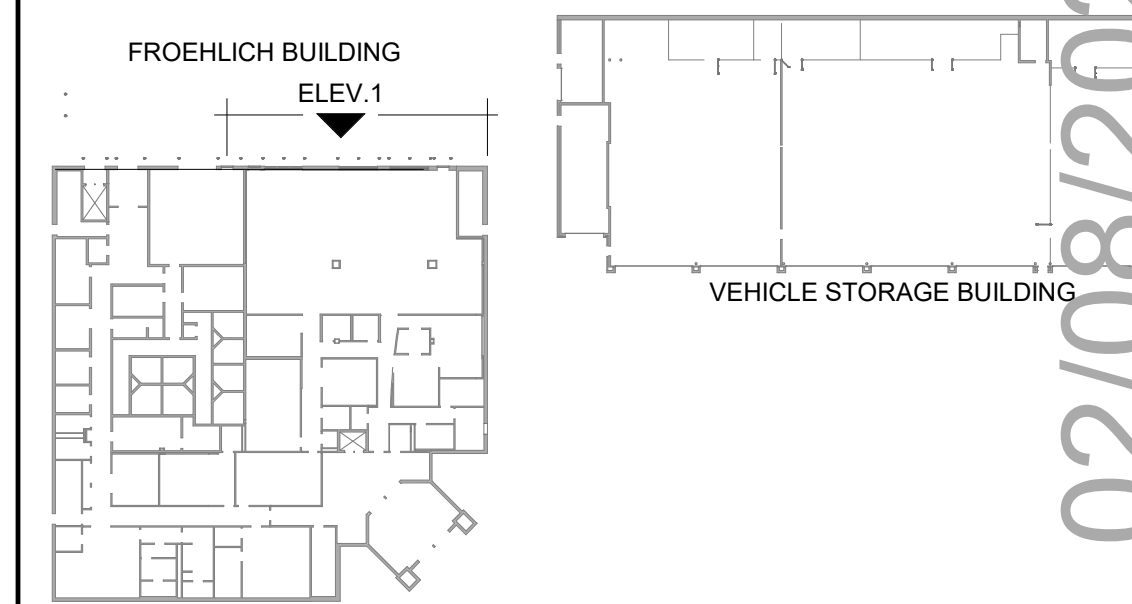
**7 TRANS PANEL - JAMB DTL**  
 1 1/2" = 1'-0"



**9 INFILL WALL - SILL DTL**  
 1 1/2" = 1'-0"



**12 TYP REPOINTING DETAIL**  
 3" = 1'-0"



KEY PLAN

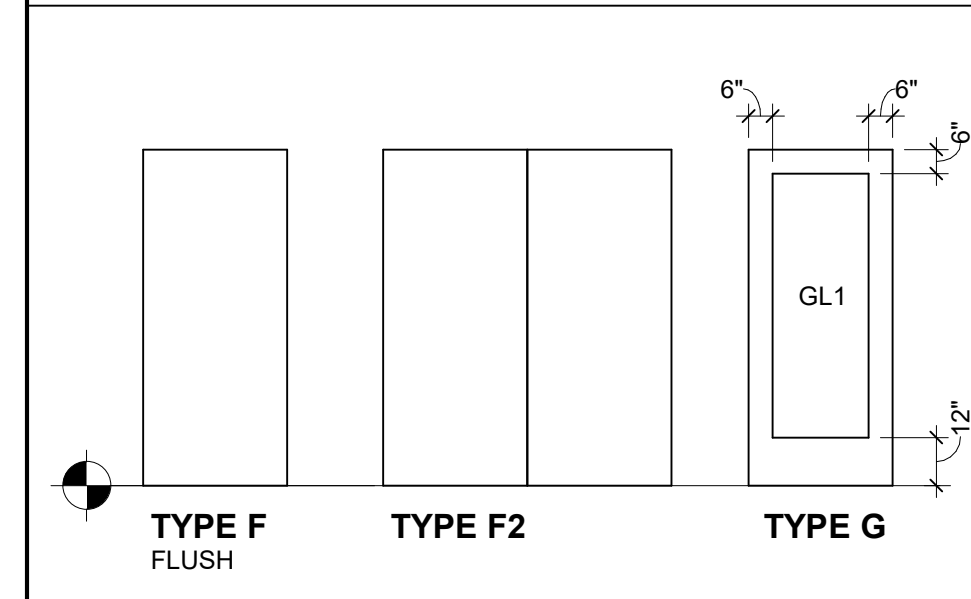
02/08/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION



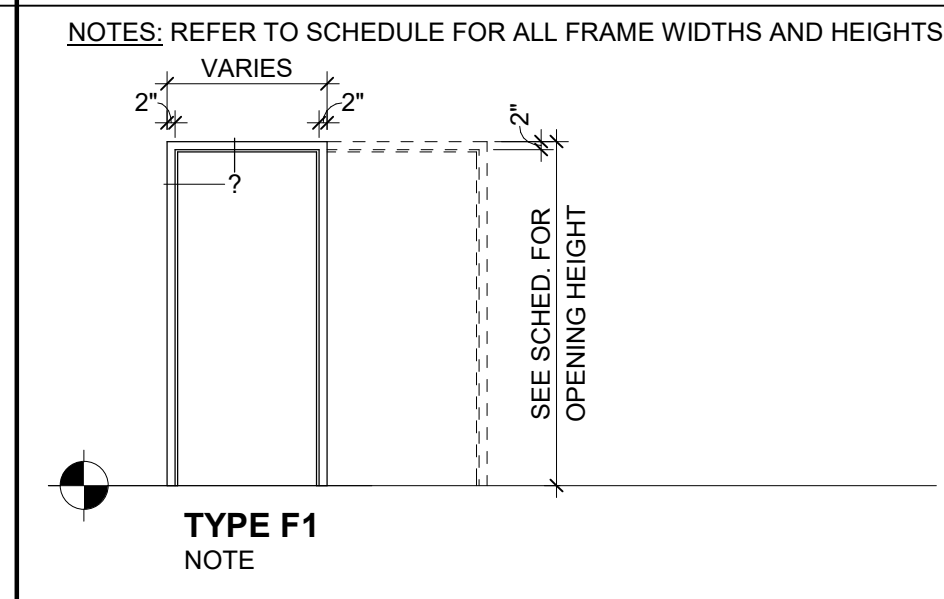
# DOOR SCHEDULE

MARK	ROOM #	ROOM NAME	DOOR				FRAME			FIRE RATING	HARDWARE SET	COMMENTS	
			TYPE	WIDTH	HEIGHT	MATERIAL	TYPE	MATERIAL	DETAIL				
Phase 1 1st FLOOR													
D103	103	EX ELEC	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D104	104	EX ELEV ROOM	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME AND DOOR	
D105	105	STORAGE	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D106	106	CORRIDOR	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME; ACTIVATE EXG CARD READER	
D107	107	UNISEX TOILET	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D108	108	RADIO TECH OFFICE	G	3'-0"	7'-0"	WD	F1	HM	-	-	5.0	-	
D109	109	OFFICE	G	3'-0"	7'-0"	WD	F1	HM	-	-	5.0	-	
D110	110	SYSTEMS OFFICE	G	3'-0"	7'-0"	WD	F1	HM	-	-	5.0	-	
D111	111	UPS/ELEC ROOM	F	6'-0"	7'-0"	HM	F1	HM	-	-	2.0	-	
D114	114	EX WOMEN	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D115	115	EX MEN	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D117A	117	DISPATCH	G	3'-0"	7'-0"	WD	2/A-301	HM	-	-	1.0	-	
D117B	117	DISPATCH	G	3'-0"	7'-0"	WD	1/A-301	HM	-	-	1.0	-	
D117C	117	DISPATCH	EXG	3'-4"	7'-4"	EXG	-	EXG	-	-	-	PRIME & PAINT INTERIOR SIDE OF DOOR AND FRAME	
D119	119	TRAINING OFFICE	G	3'-0"	7'-0"	WD	3/A-301	HM	-	-	1.0	-	
D121	121	EX. COMPUTER ROOM	EXG	3'-0"	7'-0"	EXG	-	EXG	-	-	-	PRIME & PAINT FRAME	
D147	147	SWAT GARAGE	F	3'-0"	7'-0"	HM	-	HM	-	-	6.0	-	
Phase 2 1st FLOOR													
D122A	122	TRAINING ROOM	EXG	3'-0"	7'-0"	EXG	F1	EXG	-	-	-	PRIME & PAINT EXISTING FRAME	
D122B	122	TRAINING ROOM	F	3'-0"	7'-0"	WD	F1	HM	-	-	60 Minute	3.0	CARD READER HARDWARE BY OWNER, CONTRACTOR PROVIDE WIRING, CONDUIT AND BACK-BOX.
D123	123	IT OFFICE	EXG	3'-0"	7'-0"	EXG	F1	EXG	-	-	-	PRIME & PAINT EXISTING DOOR & FRAME	
D132	132	IT OFFICE	F	3'-0"	7'-0"	WD	F1	HM	-	-	60 Minute	3.0	CARD READER HARDWARE BY OWNER, CONTRACTOR PROVIDE WIRING, CONDUIT & BACK-BOX.
D135	135	SUPPLY STORAGE	F	6'-0"	7'-0"	WD	F1	HM	-	-	60 Minute	4.0	-

# DOOR PANEL TYPE



# FRAME TYPE

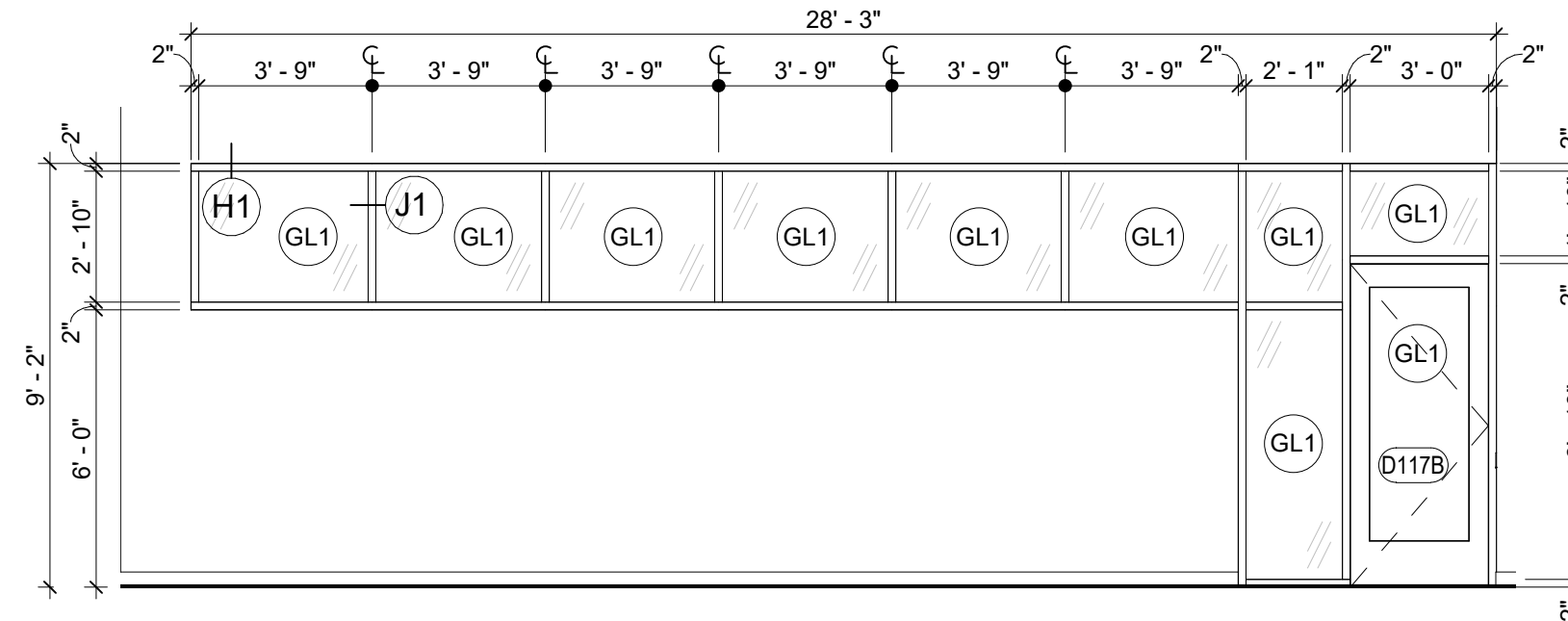


DOOR/FRAME ABBREVIATIONS	
AL	ALUMINUM
ANOD	ANODIZED
HM	HOLLOW METAL
IHM	INSULATED HOLLOW METAL
O.H.	OVER HEAD
PT	PAINTED
WD	WOOD

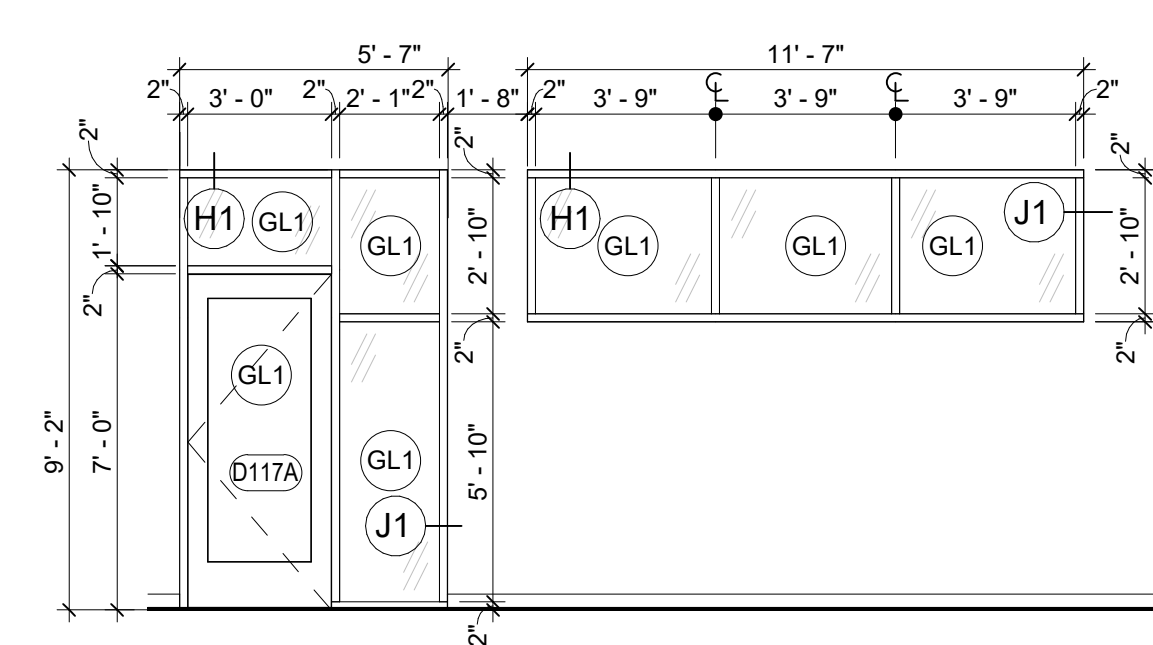
# GLASS TYPE SCHEDULE

Note Number	Type Description	Glass Application
GL1	1/4" LAMINATED SAFETY GLASS - CLEAR	

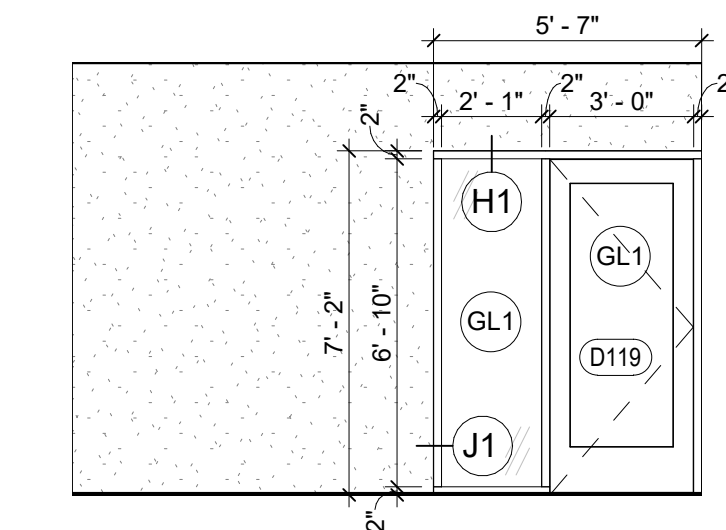
# GLAZING FRAMING TYPES



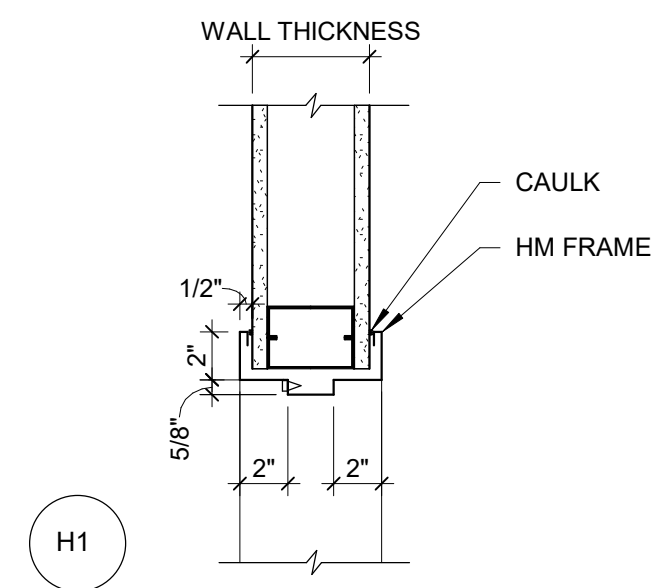
1 WINDOW TYPE A  
1/4" = 1'-0"



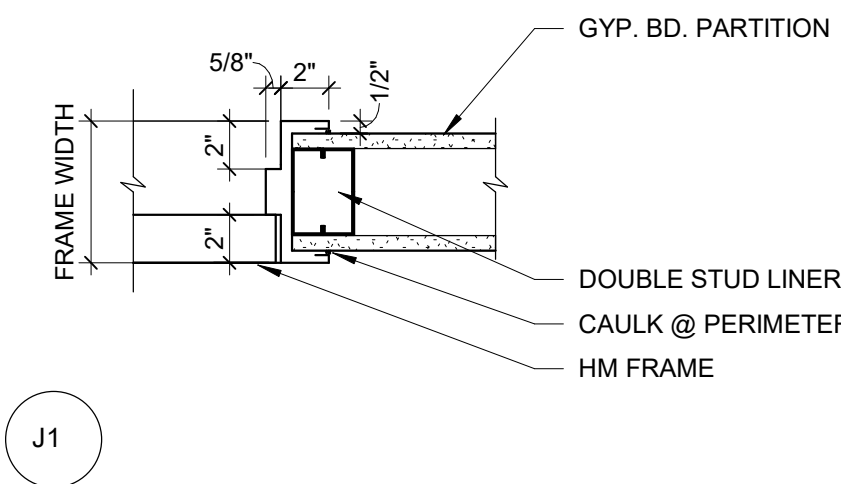
2 WINDOW TYPE B  
1/4" = 1'-0"



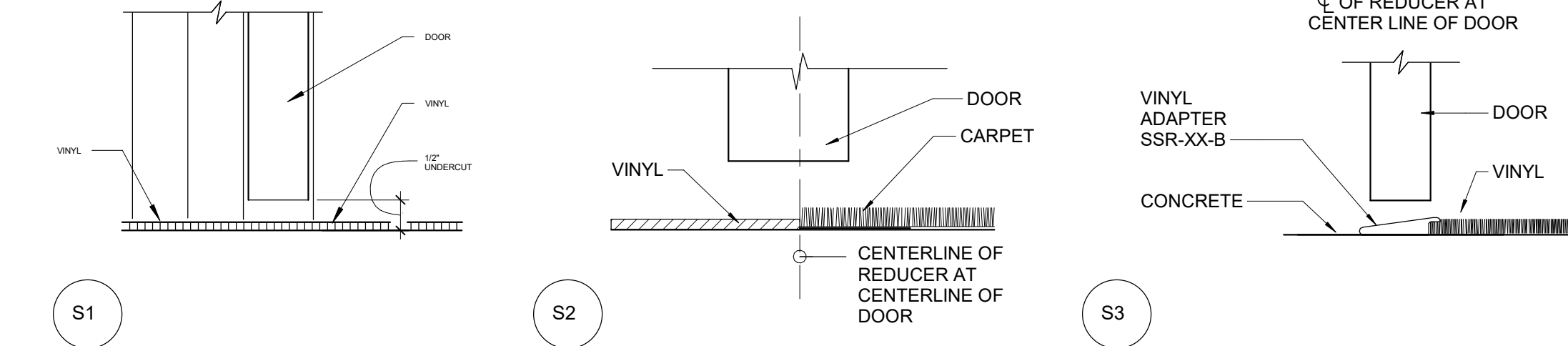
3 WINDOW TYPE C  
1/4" = 1'-0"



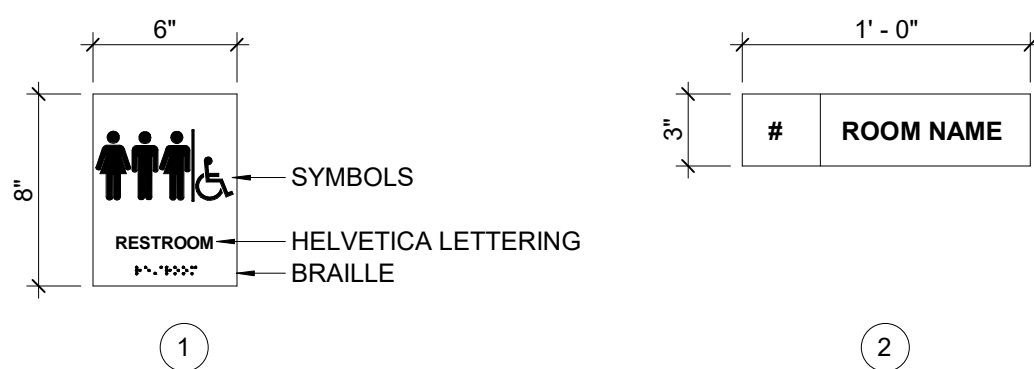
4 HEAD DETAILS  
1 1/2" = 1'-0"



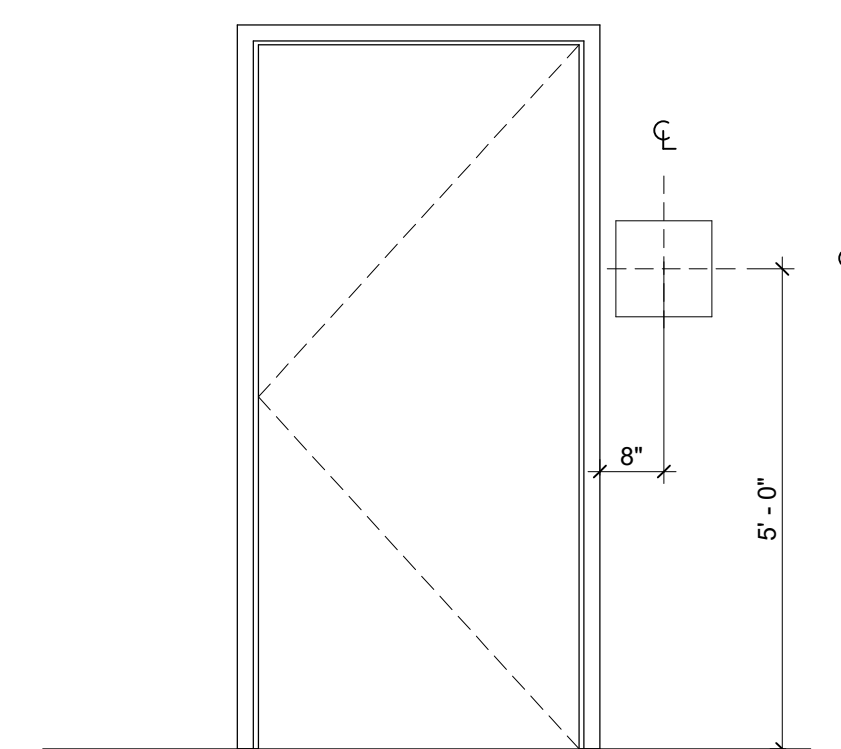
5 JAMB DETAILS  
1 1/2" = 1'-0"



6 SILL DETAILS  
3" = 1'-0"



7 SIGNAGE ELEVATIONS  
1 1/2" = 1'-0"



8 TYP SIGN MOUNTING DETAIL  
1/2" = 1'-0"

# SIGNAGE SCHEDULE

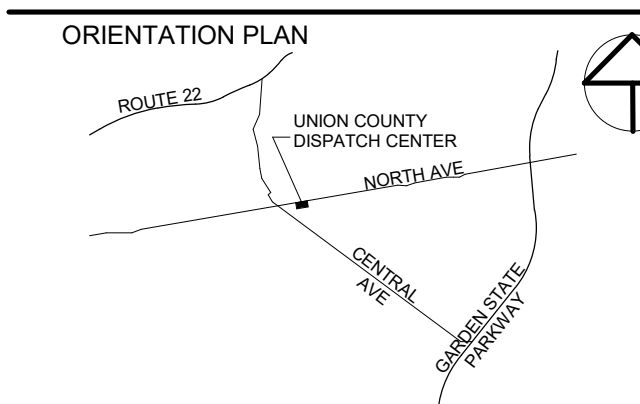
MARK	DESCRIPTION	CODE REFERENCE	LOCATION	COMMENTS
1	RESTROOM	-	PROVIDE AT ALL RESTROOM LOCATIONS	(3) SIGNS ROOM 107, 114, 115
2	ROOM SIGN	-	PROVIDE AT ALL ROOMS	
3	EGRESS PLAN	-	PROVIDE (1) EGRESS SIGN	ARCHITECT TO PICK LOCATIONS IN FIELD
4	OCCUPANT LOAD	IBC 1004.3	PROVIDE AT TRAINING ROOM 122 AND DISPATCH ROOM 117	

- NOTES:
- ALL SIGNS SHALL COMPLY WITH ICC/ANSI A117.1-1998
  - CHARACTERS AND THEIR BACKGROUND SHALL HAVE A NON GLARE FINISH. CHARACTERS SHALL CONTRAST WITH THEIR BACKGROUND. COLORS SHALL BE AS SELECTED BY THE ARCHITECT.
  - MOUNTING HEIGHT - MOUNT TOP OF SIGNS 60" ABOVE ADJACENT FLOOR SURFACE.
  - MOUNTING LOCATION - SIGNS SHALL BE WALL MOUNTED ON THE LATCH SIDE OF THE DOOR. IN THE CASE OF DOUBLE DOORS, SIGNS SHALL BE WALL MOUNTED ON THE RIGHT SIDE OF DOORS. THE CENTERLINE OF THE SIGNS SHALL BE 9" FROM THE EDGE OF THE DOOR. IN THE CASE OF STOREFRONT LOCATIONS SIGN TO BE MOUNTED OPPOSITE OF DOORS LATCH.
  - SIGNAGE SHALL BE MANUFACTURED BY APCO GRAPHICS, INC., ACORD 15 MODULAR SIGN SYSTEM.
  - ALUMINUM BANDS SNAP ONTO LOW PROFILE (3/8" DEPTH), INTEGRALLY COLORED, INJECTION MOLDED END CLIPS.
  - TYPEFACE SHALL BE SANS SERIF, LEFT JUSTIFIED.
  - SIGNS SHALL BE MOUNTED WITH DOUBLE-FACED TAPE AND A SUFFICIENT AMOUNT OF SILICONE ADHESIVE. SEE MOUNTING DETAIL.
  - SIGNS SHALL BE ADA COMPLIANT. COMPLETE WITH BRILLE AND HANDICAP SYMBOL WHERE INDICATED.
  - SIGNAGE COLOR SHALL MATCH ARCHITECT'S SAMPLE. TO BE SELECTED, WITH WHITE COPY. END CLIP TYPE AND SHAPE TO BE SELECTED.
  - ROOM NUMBERS TO BE COORDINATED WITH OWNER.

ISS/REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1
2	03/17/21	ISSUED FOR BID REV2

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CONSULTANT



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**Harry T. Osborne**  
Registered Architect - New York  
License no. 021300

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County of Union



PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROELICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME

DOOR SCHEDULE, TYPE ELEVATIONS AND DETAILS

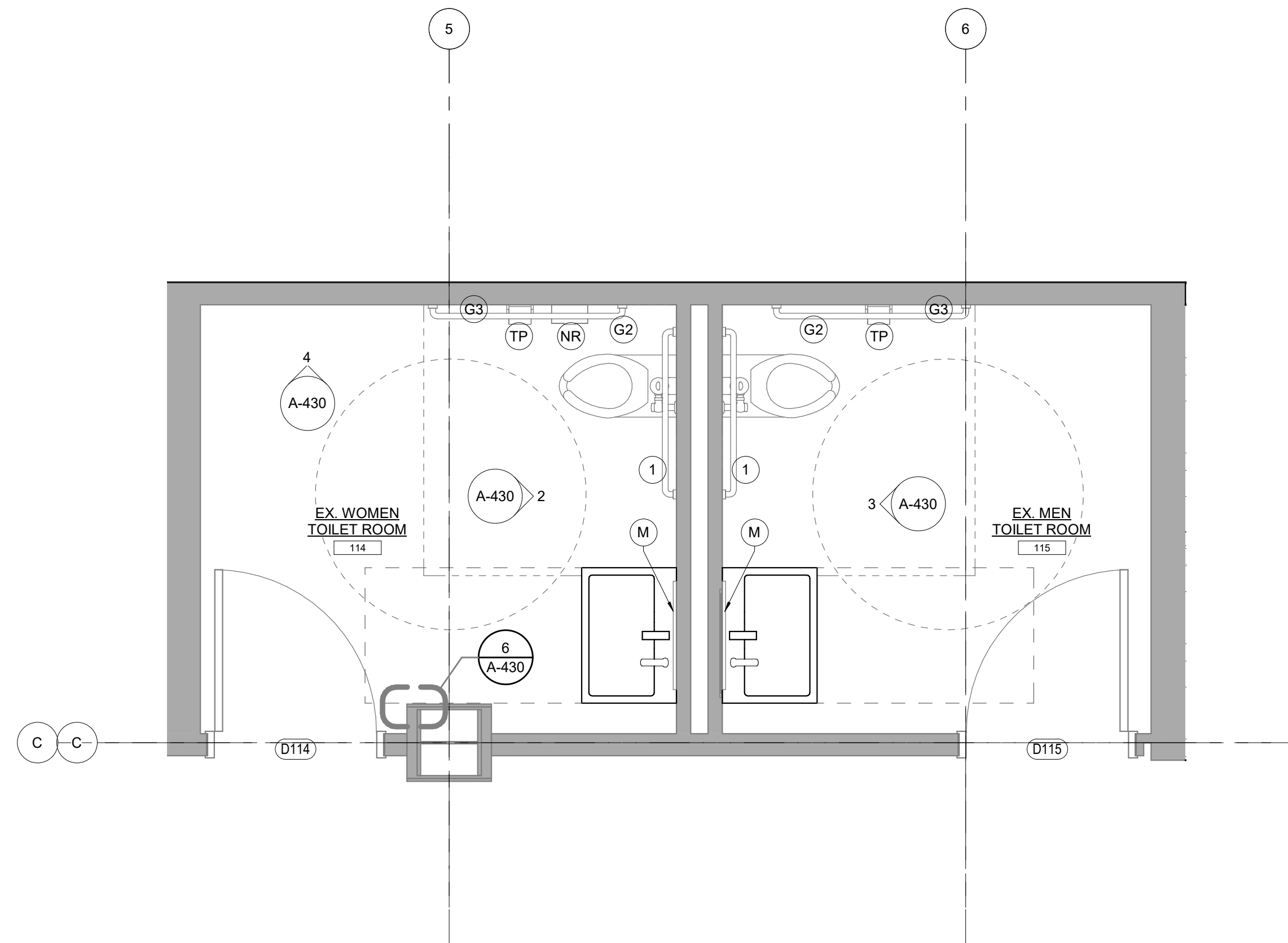
JOB NO.: 03009002  
DATE: 04/28/2020  
DRAWN: JRF  
CHECK: JMG  
SCALE: As indicated

SHEET NO.

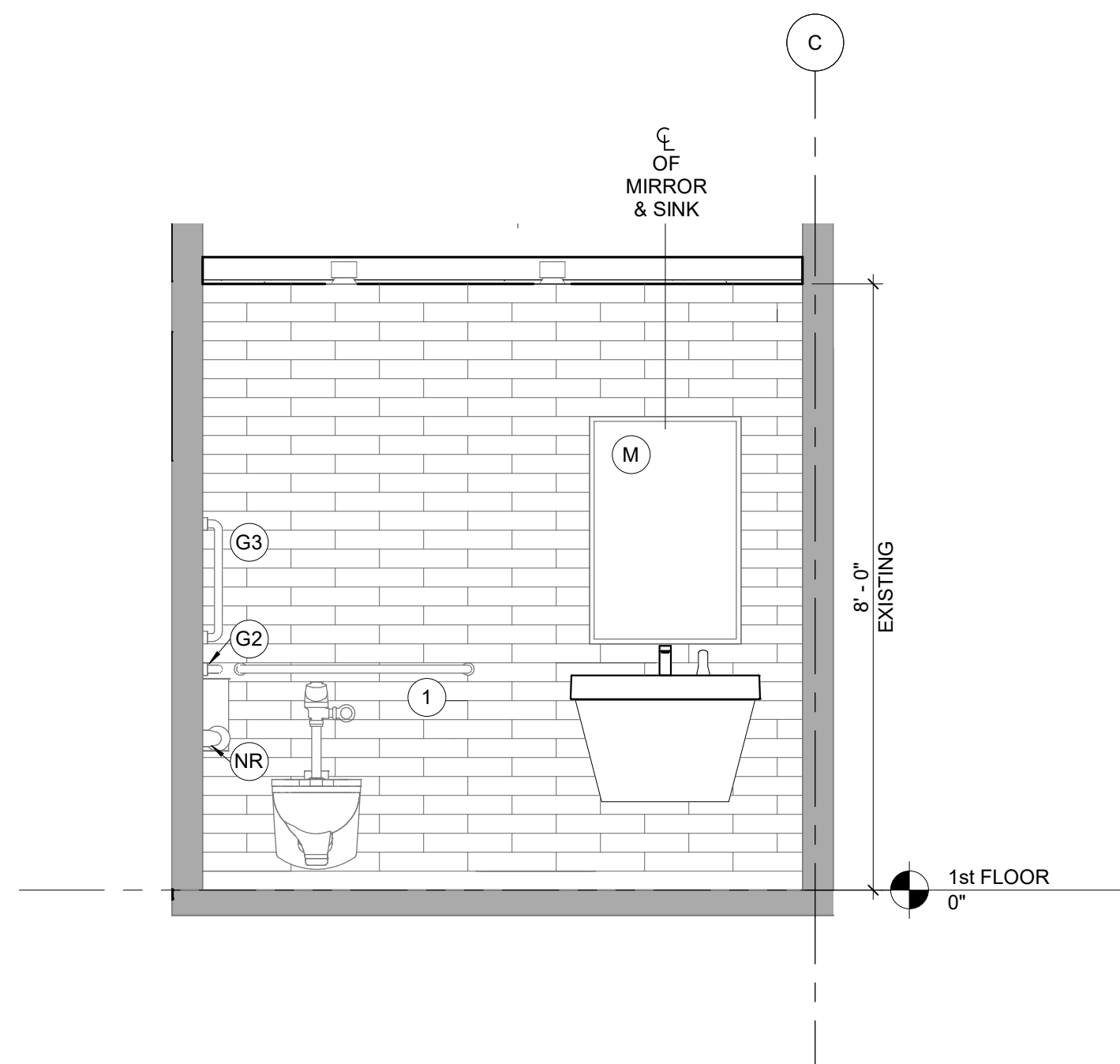
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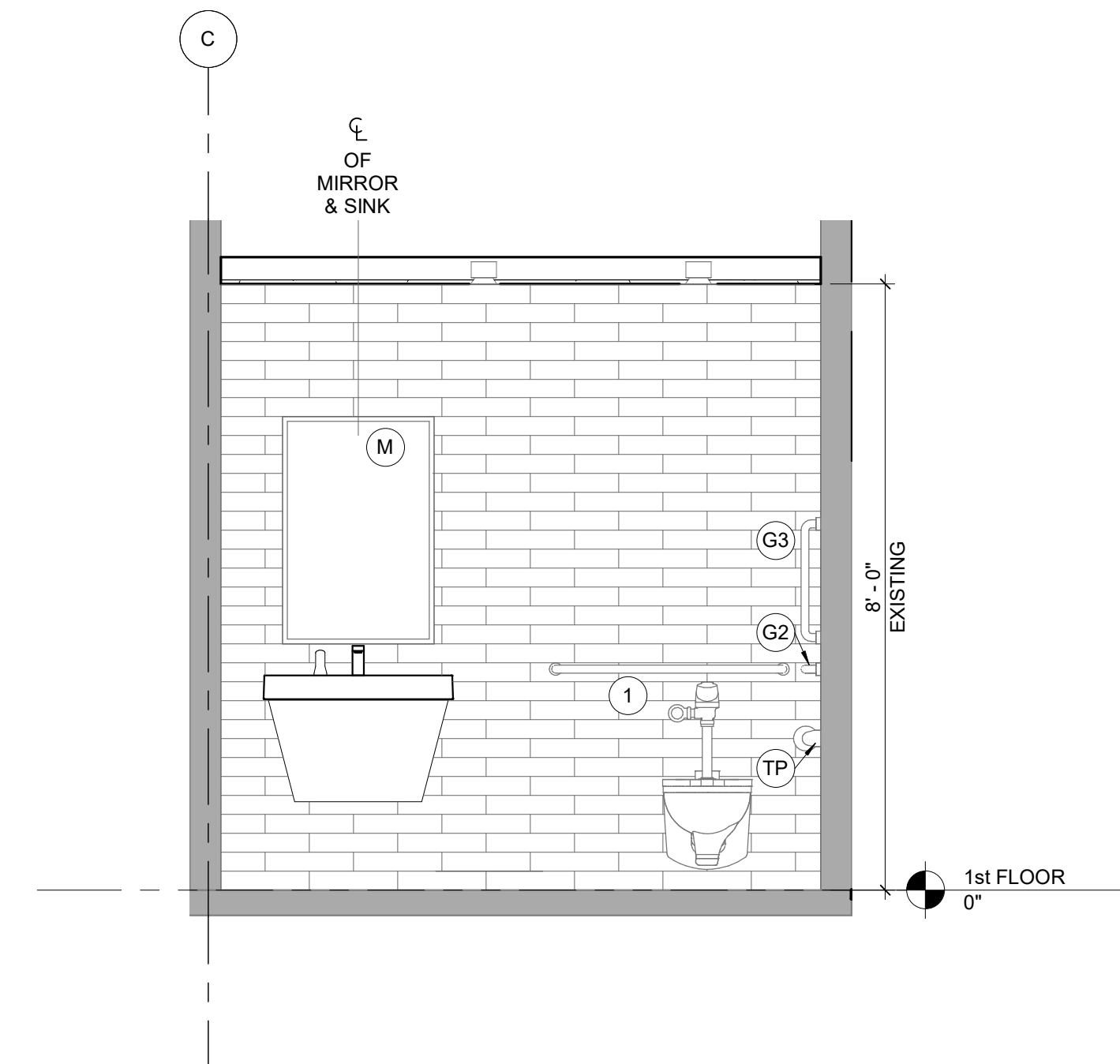




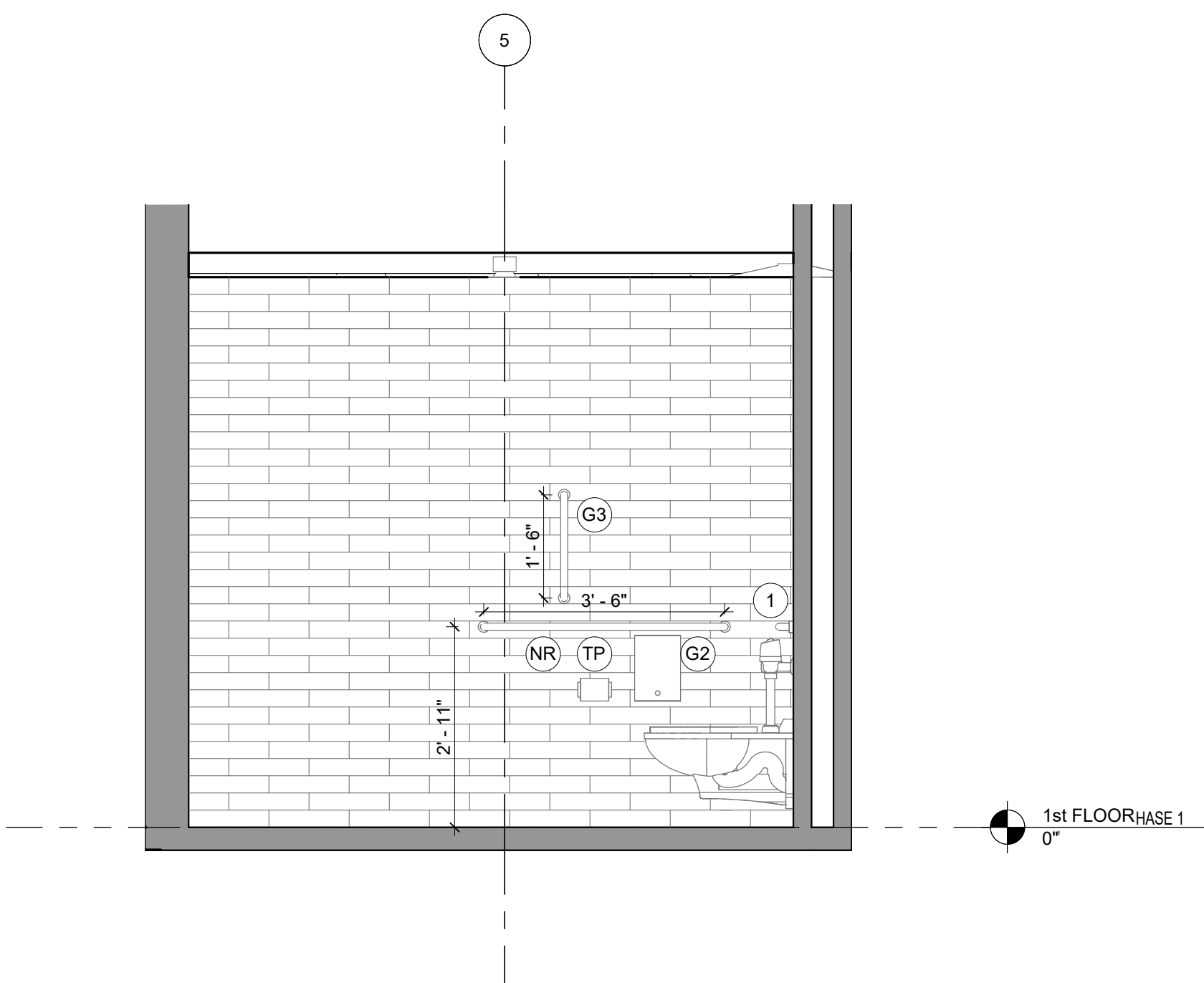
**1 ENLARGED TOILET ROOMS**  
1/2" = 1'-0"



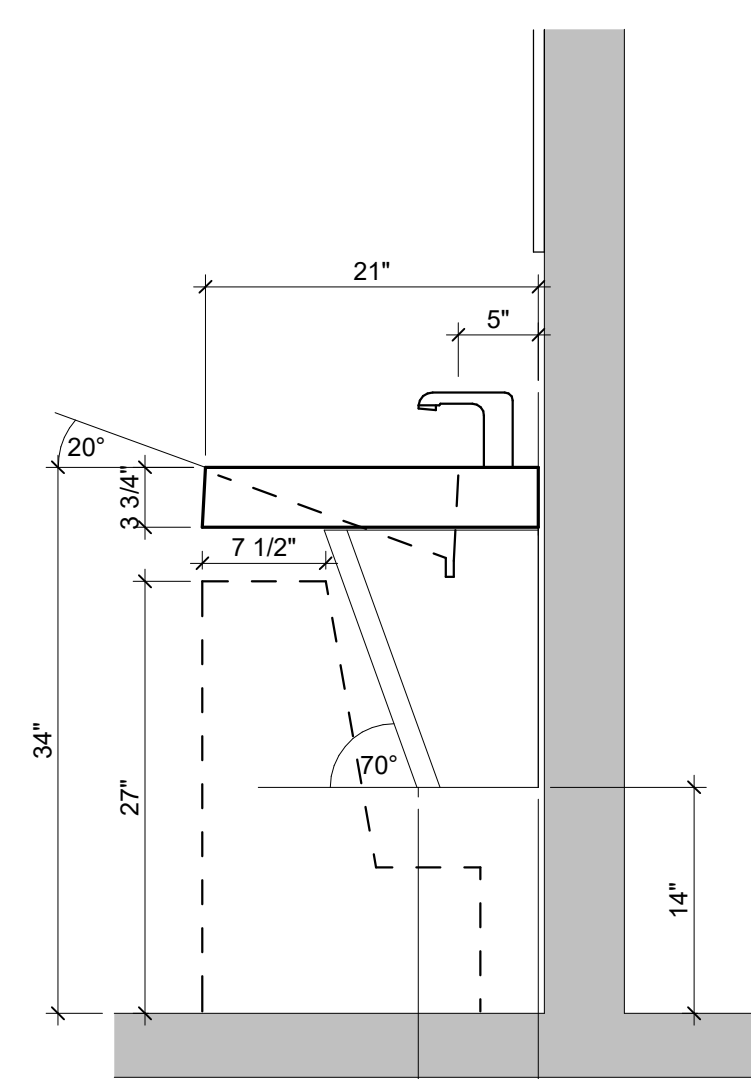
**2 ELEVATION - WOMEN'S TOILET ROOM**  
1/2" = 1'-0"



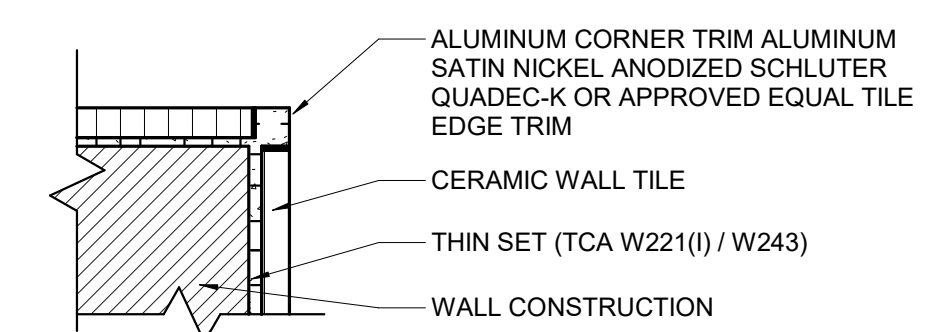
**3 ELEVATION - MEN'S TOILET ROOM**  
1/2" = 1'-0"



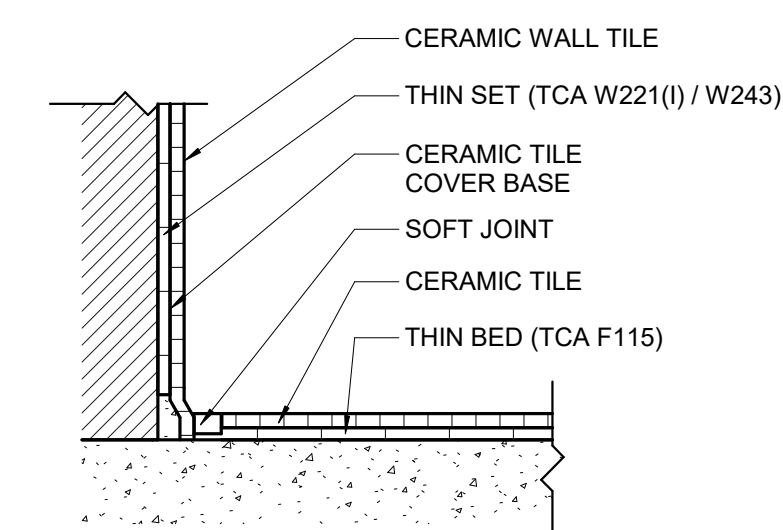
**4 ELEVATION - WATER CLOSET SIDEWALL**  
1/2" = 1'-0"



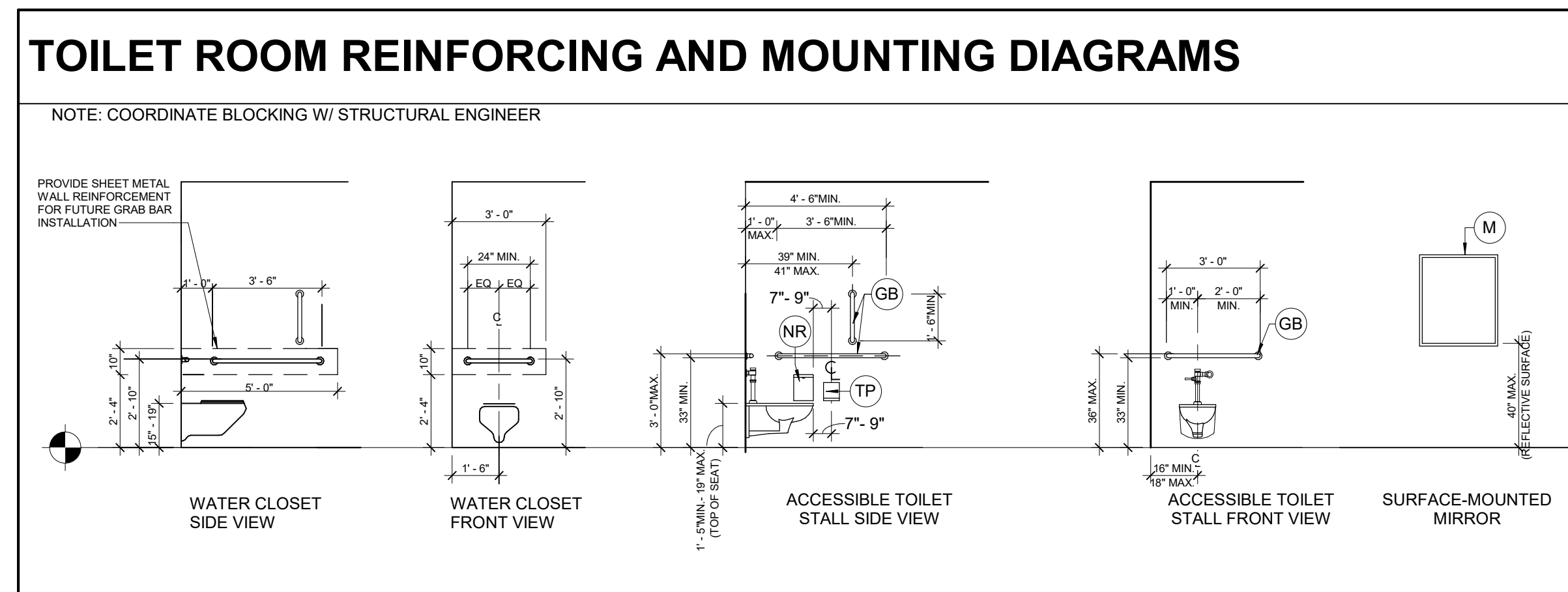
**5 SECTION @ TOILET ROOM SINK**  
1" = 1'-0"



**6 ALUMINUM CORNER TRIM**  
1" = 1'-0"



**7 CERAMIC TILE BASE**  
1" = 1'-0"



#	DESCRIPTION	MANUFACTURER (OR APPROVED EQUAL)	MODEL # (OR APPROVED EQUAL)	COMMENTS
1	36" GRAB BAR	BOBRICK	B - 6806X36	REAR
G2	42" GRAB BAR	BOBRICK	B - 6806X42	SIDE
G3	18" GRAB BAR	BOBRICK	B - 6806X18	VERTICAL
M	MIRROR	NOVO	NOV2-30x42-L7CSHD-WG2030K	ELECTRIC MIRROR WITH WALL GLOW
NR	SANITARY NAPKIN DISPOSAL	BOBRICK	B - 35139	SURFACE MOUNTED - WOMENS ROOM ONLY
TP	TOILET TISSUE DISPENSER	BOBRICK	B - 6867	SURFACE MOUNTED - DOUBLE ROLL

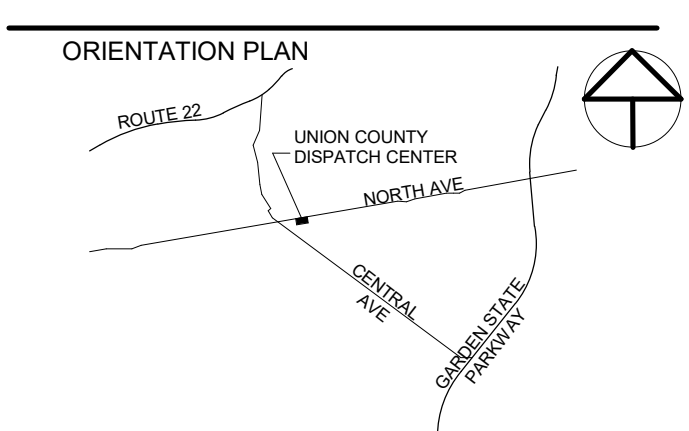
**TOILET ROOM PLAN NOTES**

- REFER TO PLUMBING DRAWINGS FOR ALL FIXTURE INFORMATION.
- HANDICAPPED ACCESSIBLE TOILETS ARE TO HAVE REQUIRED HANDICAPPED CLEARANCES MAINTAINED AND ARE TO BE PROVIDED WITH HANDICAP ACCESSIBLE FIXTURES AND WITH ALL REQUIRED GRAB BARS.
- ALL EXPOSED WATER SUPPLY DRAIN PIPES AND SURFACES UNDER HANDICAP ACCESSIBLE LAVATORIES OR SINKS SHALL BE INSULATED AGAINST CONTACT. REFER TO PLUMBING DRAWINGS. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES UNDER ACCESSIBLE LAVATORIES OR SINKS.
- MAXIMUM FORCE TO OPERATE THE CONTROLS SHALLS SHALL BE NO GREATER THAN FIVE (5) POUNDS.
- GRAB BARS SHALL HAVE AN OUTSIDE DIAMETER OF NO LESS THAN 1-1/4" OR NO MORE THAN 1-1/2", AND SHALL PROVIDE A CLEARANCE OF 1-1/2" BETWEEN THE GRAB BAR AND THE WALL. GRAB BARS TO BE TYPE-304 STAINLESS STEEL WITH SATIN-FINISH.
- ALL GRAB BARS AND ADJACENT SURFACES SHALL BE FREE OF ANY SHARP OR ABRASIVE ELEMENTS. EDGES SHALL HAVE A MINIMUM RADIUS OF 1/4".
- BENDING STRESS IN A GRAB BAR INDUCED BY THE MAXIMUM BENDING MOMENT FROM THE APPLICATION OF 250 POUNDS SHALL BE LESS THAN THE ALLOWABLE FOR THE MATERIAL.
- GRAB BARS SHALL NOT ROTATE WITHIN THEIR FITTINGS.
- PROVIDE 12" WIDE 18 GAUGE METAL BLOCKING AT ALL TOILET ACCESSORIES IN PARTITIONS WITH FASTENERS @ 6" O.C. DO NOT USE METAL STUDS FOR BLOCKING.
- ALL WALLS RECEIVING TILE SHOULD USE TILE BACKER BOARD INSTEAD OF GYPSUM. SAME THICKNESS AS SCHEDULED.
- PROVIDE BLOCKING FOR ALL TOILET ACCESSORIES.
- ALL ACCESSORIES TO BE COORDINATED WITH OWNER.

ISS / REV	DATE	ISSUE DESCRIPTION
A	07/10/20	ISSUED FOR 50% REVIEW
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

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**Harry T. Osborne**  
Registered Architect - New York  
License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

County of Union

PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROELICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME

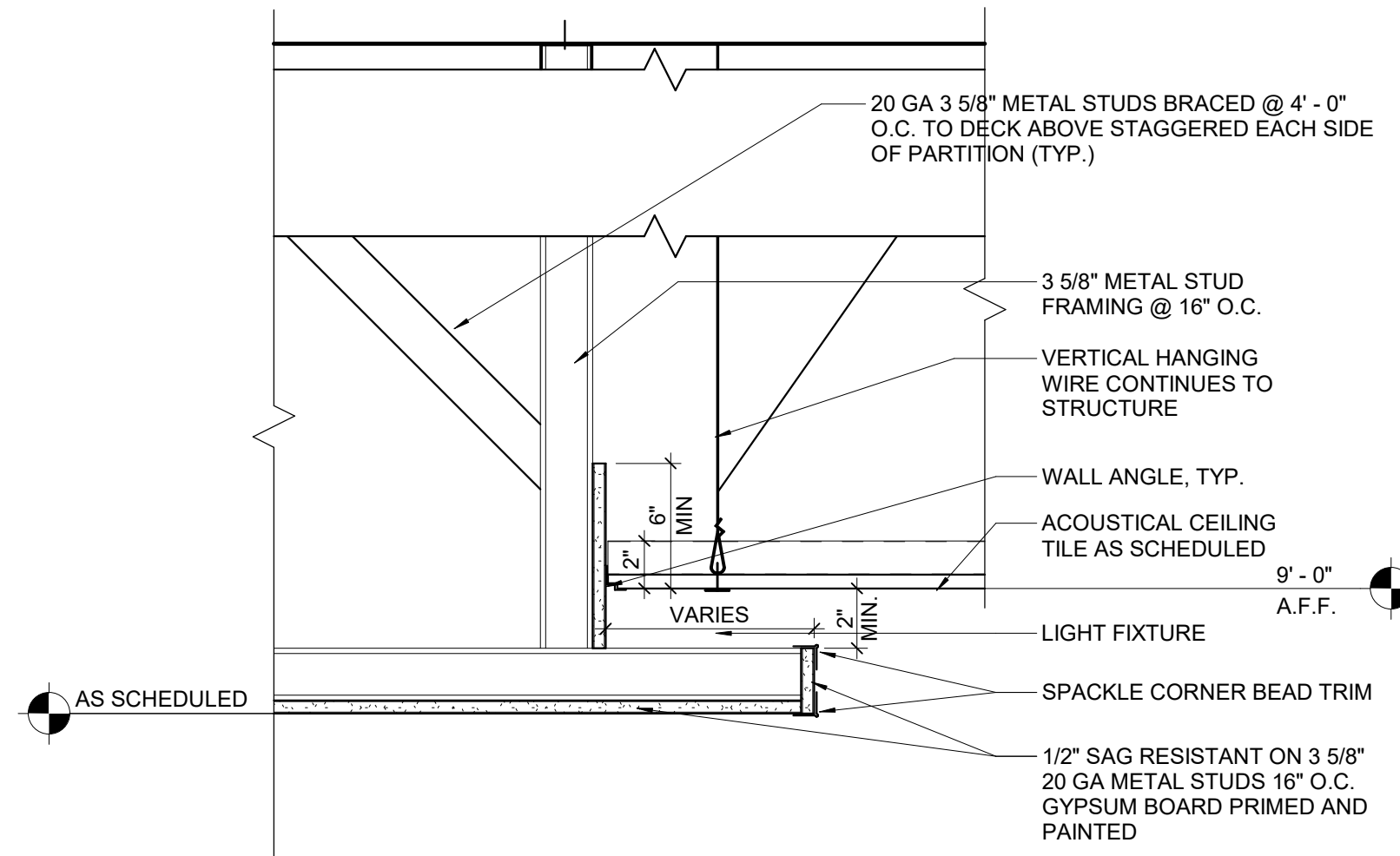
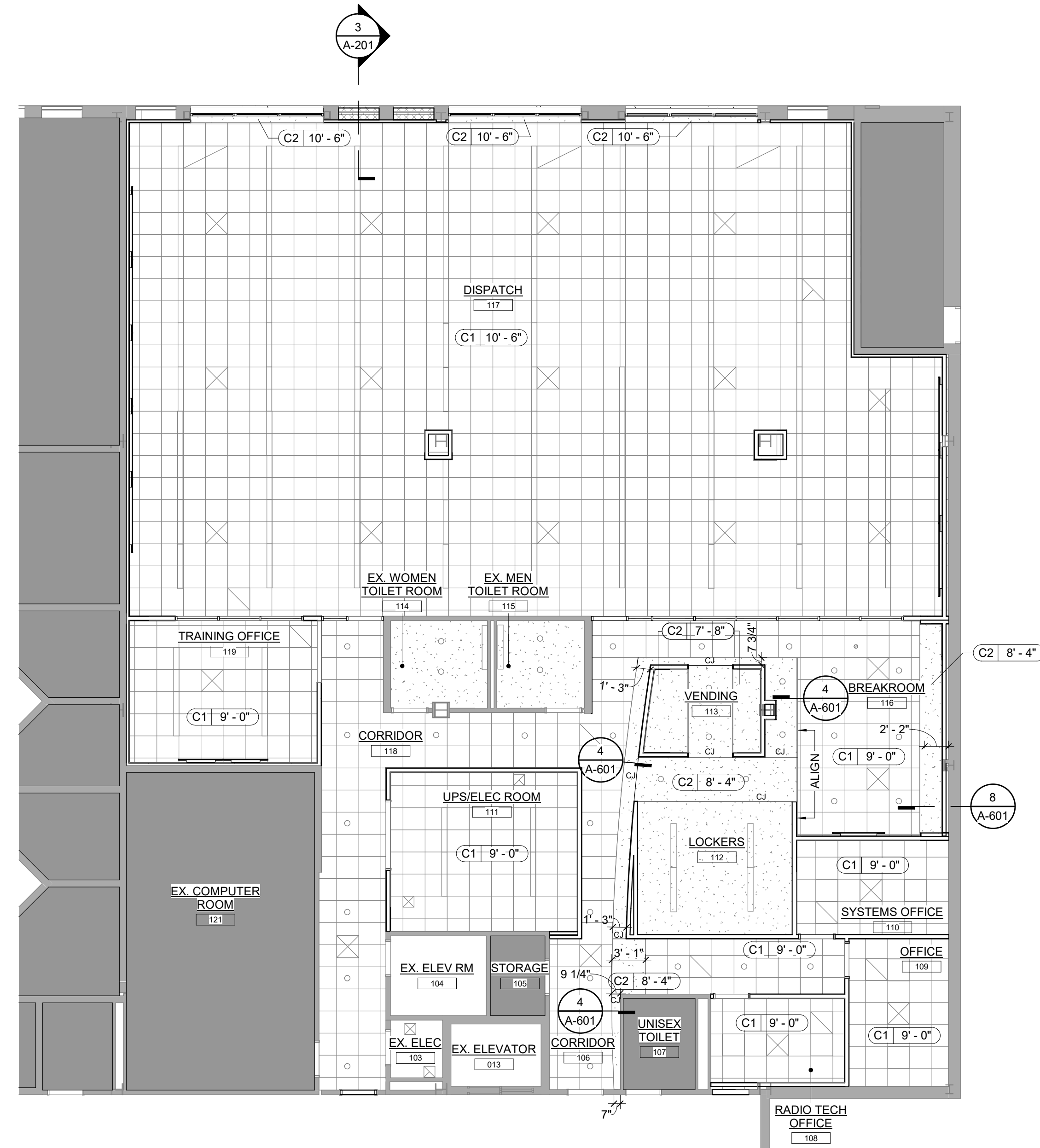
TOILET PLANS, ELEVATIONS AND DETAILS

JOB NO.: 030090002  
DATE: 04/28/2020  
DRAWN: Author  
CHECK: Checker  
SCALE: As indicated  
SHEET NO.

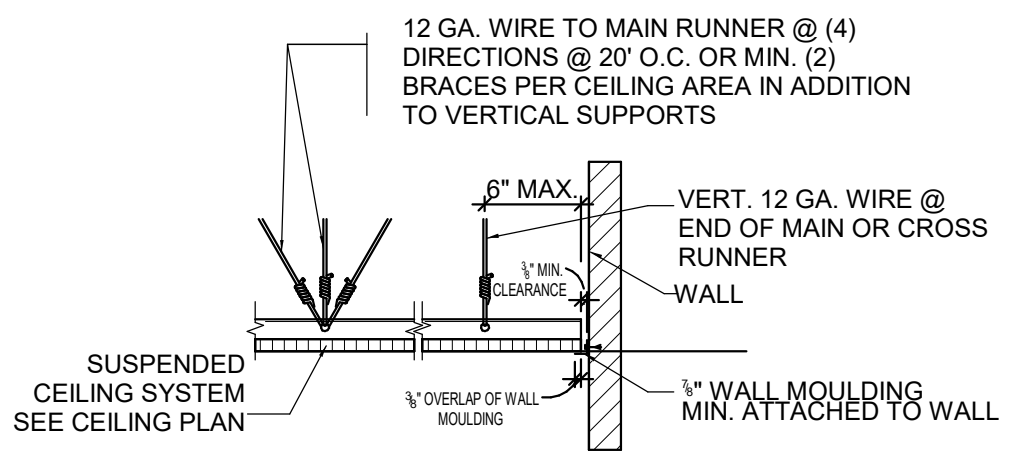
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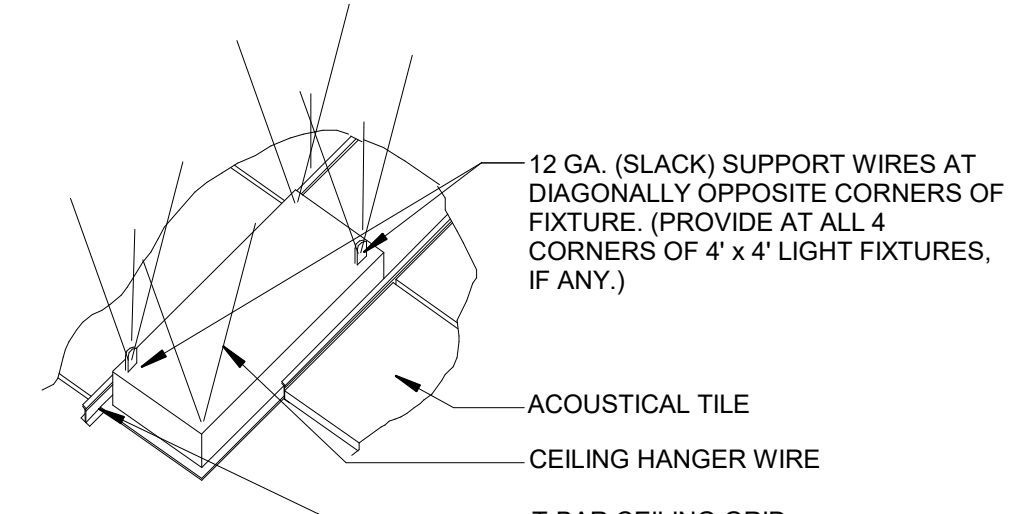




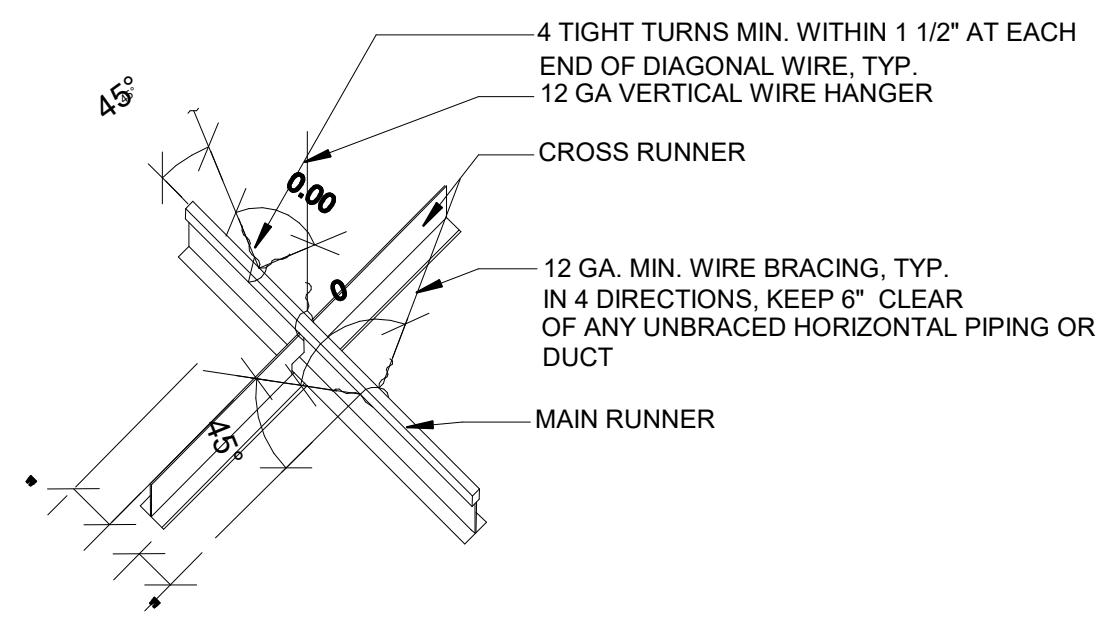
**4 SOFFIT DETAIL**  
1 1/2" = 1'-0"



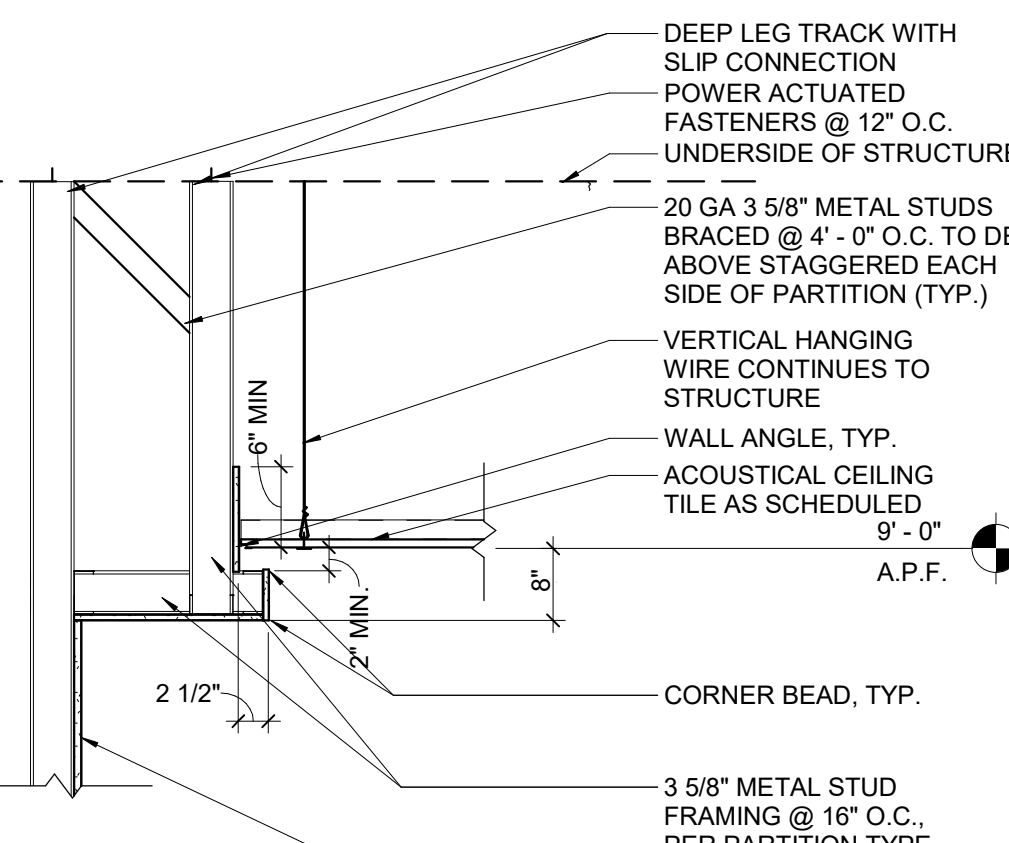
**5 CEILING DETAIL**  
1" = 1'-0"



**6 LIGHTING FIXTURE**  
1/2" = 1'-0"

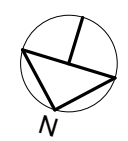


**7 HORIZ SEISMIC RESTRAINT**  
1/2" = 1'-0"

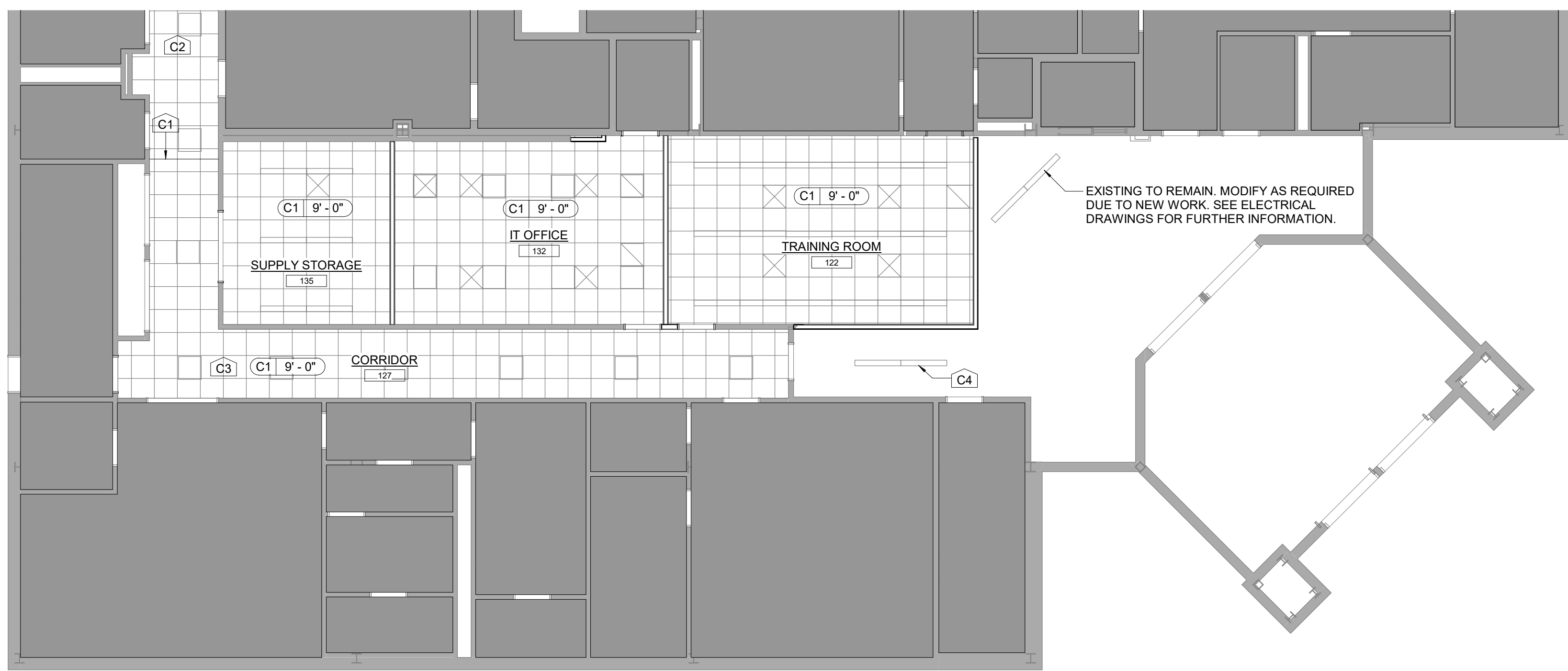


**8 SOFFIT DETAIL**  
3/4" = 1'-0"

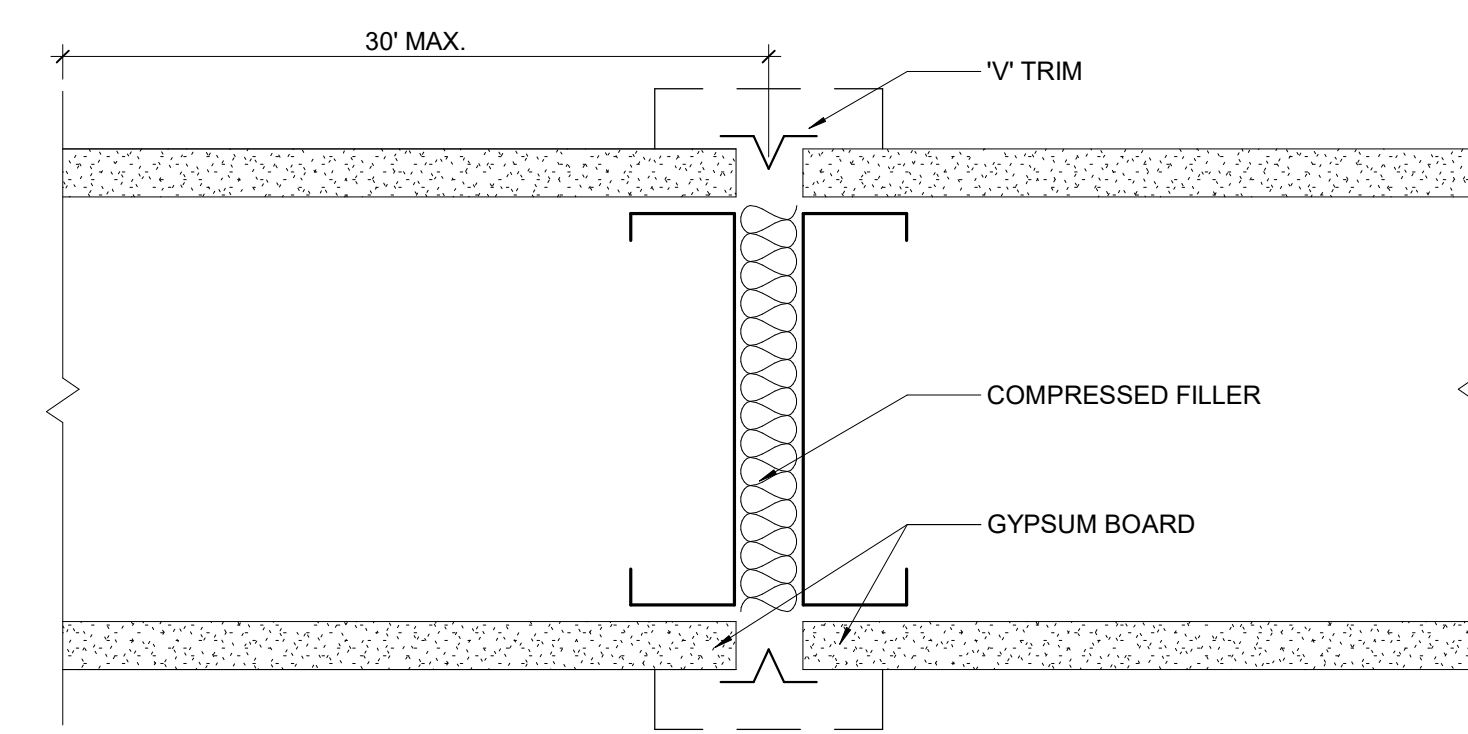
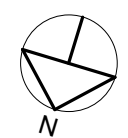
NOTE: CONTRACTOR TO CREATE CURVED SOFFITS WITH PLOTTED POINTS SHOWN. USE OFFSETS FROM CURVED PROPORTIONS BELOW. SEE PLAN. OWNER TO APPROVE FINAL LAYOUT



**1 PARTIAL 1ST FLOOR REFLECTED CEILING PLAN FROEHLICH BUILDING - PHASE 1**  
1/8" = 1'-0"



**2 PARTIAL 1ST FLOOR REFLECTED CEILING PLAN FROEHLICH BUILDING - PHASE 2**  
1/8" = 1'-0"



**9 GYPSUM CONTROL JOINT**  
1/8" = 1'-0"

**CEILING NOTES**

- REFER TO CEILING AND SOFFIT DETAILS.
- REFER TO SHEET A-701 INTERIOR FINISH SCHEDULE FOR ADDITIONAL INFORMATION.
- ALL LIGHTS AND SPRINKLER HEADS TO BE CENTERED ON CEILING TILE.
- ALL GRIDS ARE CENTERED IN ROOMS UNLESS OTHERWISE NOTED.
- THIS DRAWING IS TO BE USED IN CONJUNCTION WITH ENGINEER'S DRAWINGS. REFER TO ENGINEER'S DRAWINGS FOR CEILING EQUIPMENT/ACCESSORY LOCATIONS AND SWITCH LOCATIONS.
- ALL DIFFUSERS AND RETURNS SHALL HAVE FRAMES COMPATIBLE WITH CEILING SYSTEM FOR FLUSH FIT.
- ALL MULTIPLE SWITCHES SHALL BE SET IN COMMON GANG PLATE BOX. IN RATED WALLS, GANG SWITCHES AS ALLOWABLE BY GOVERNING CODE.
- CEILING HEIGHTS, WHERE INDICATED, ARE FROM THE FINISHED FLOOR TO THE BOTTOM OF CEILING FINISH SURFACE.
- ALL PIPES & DUCTS SHALL BE INSTALLED A MINIMUM OF 3" ABOVE SUSPENDED CEILINGS.
- UNLESS NOTED OTHERWISE, FINISHES FOR ALL WALLS SHALL EXTEND A MINIMUM OF 6" ABOVE SUSPENDED OR FURRED CEILINGS.
- NO SUSPENDED OR FURRED CEILINGS SHALL BE INSTALLED IN AREAS WHERE PIPES ARE TO BE CONCEALED UNTIL PIPING HAS BEEN TESTED.
- ALL GYPSUM BOARD USED IN CEILING CONSTRUCTION TO BE MOLD RESISTANT & SAG RESISTANT.

**CEILING TYPE**

	EXISTING CEILING TO REMAIN
	C1 2 X 2 ACOUSTICAL CEILING TILE; GENERAL PURPOSE USE
	C2 1/2" GYPSUM BD ON 3 5/8" METAL STUD

**CEILING PLAN LEGEND**

Name	ROOM NAME
XXXXXX	ROOM NUMBER
C1	CEILING TYPE
C2	CEILING HEIGHT
CJ	1/2" TRIM GYPSUM CONTROL JOINT (SEE DETAIL 9/A-601)

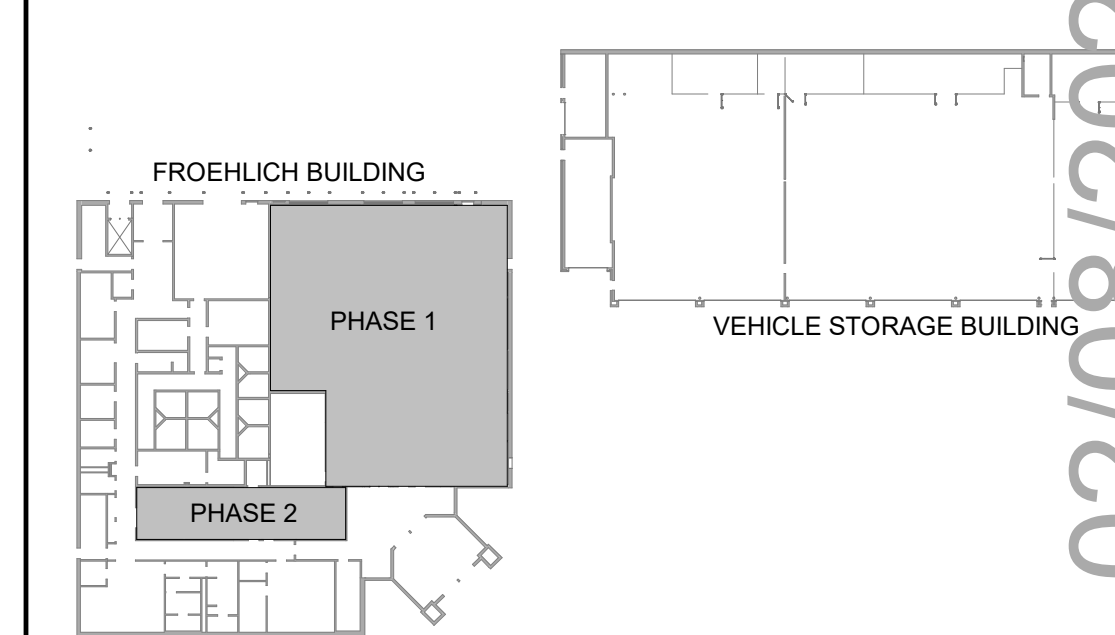
**CEILING FIXTURE LEGEND**

	2' X 2' LIGHT FIXTURE
	2' X 4' LIGHT FIXTURE
	CAN LIGHT FIXTURE
	PENDANT UTILITY FIXTURE
	EXIT SIGN - ARROWS INDICATE EGRESS DIRECTION, SHADING INDICATES FACE
	STROBE LIGHT
	DAYLIGHT SENSOR
	SMOKE DETECTOR
	OCCUPANCY SENSOR
	COMBINATION SPEAKER / STROBE
	HEAT DETECTOR
	VACANCY SENSOR
	HORN STROBE
	EMERGENCY BATTERY PACK
	EMERGENCY LIGHT FIXTURE
	ELECTRIC UNIT HEATER
	EXHAUST GRILLE
	RETURN AIR
	SUPPLY AIR
	SUPPLY AIR DIFFUSER
	LINEAR DIFFUSER
	CEILING FAN

NOTE: SEE ELECTRICAL, MECHANICAL, PLUMBING & FIRE PROTECTION DRAWINGS FOR SPECIFIC DISCIPLINE LEGEND.

**CEILING TAG NOTES**

- C2 EXISTING CEILING GRID AND TILES TO REMAIN. REPLACE ANY TILES OR GRID DAMAGED DURING THE PROJECT TO MATCH EXISTING.
- C3 INSTALL EXISTING LAY-IN LIGHT FIXTURES AND DIFFUSERS REMOVED AND SAVED FOR RE-USE FROM THE SAME AREA DUE TO NEW MECHANICAL WORK. REFER TO THE MECHANICAL AND ELECTRICAL DRAWINGS FOR FURTHER INFORMATION.
- C4 RELOCATED PENDANT LIGHT FIXTURE

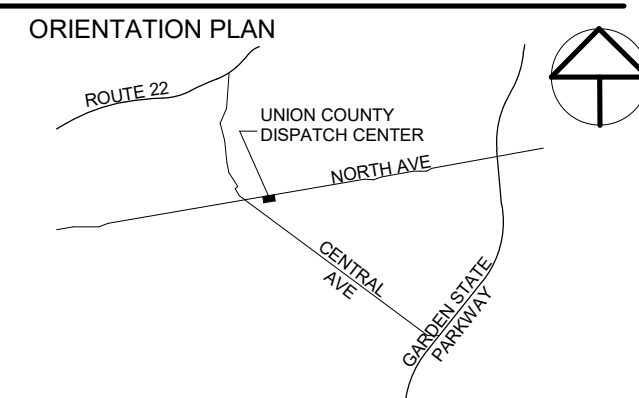


**KEY PLAN**

ISS / REV	DATE	ISSUE DESCRIPTION
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0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

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**Harry T. Osborne**  
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License no. 021300

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

County of Union



PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

FROEHLICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME

REFLECTED CEILING PLANS

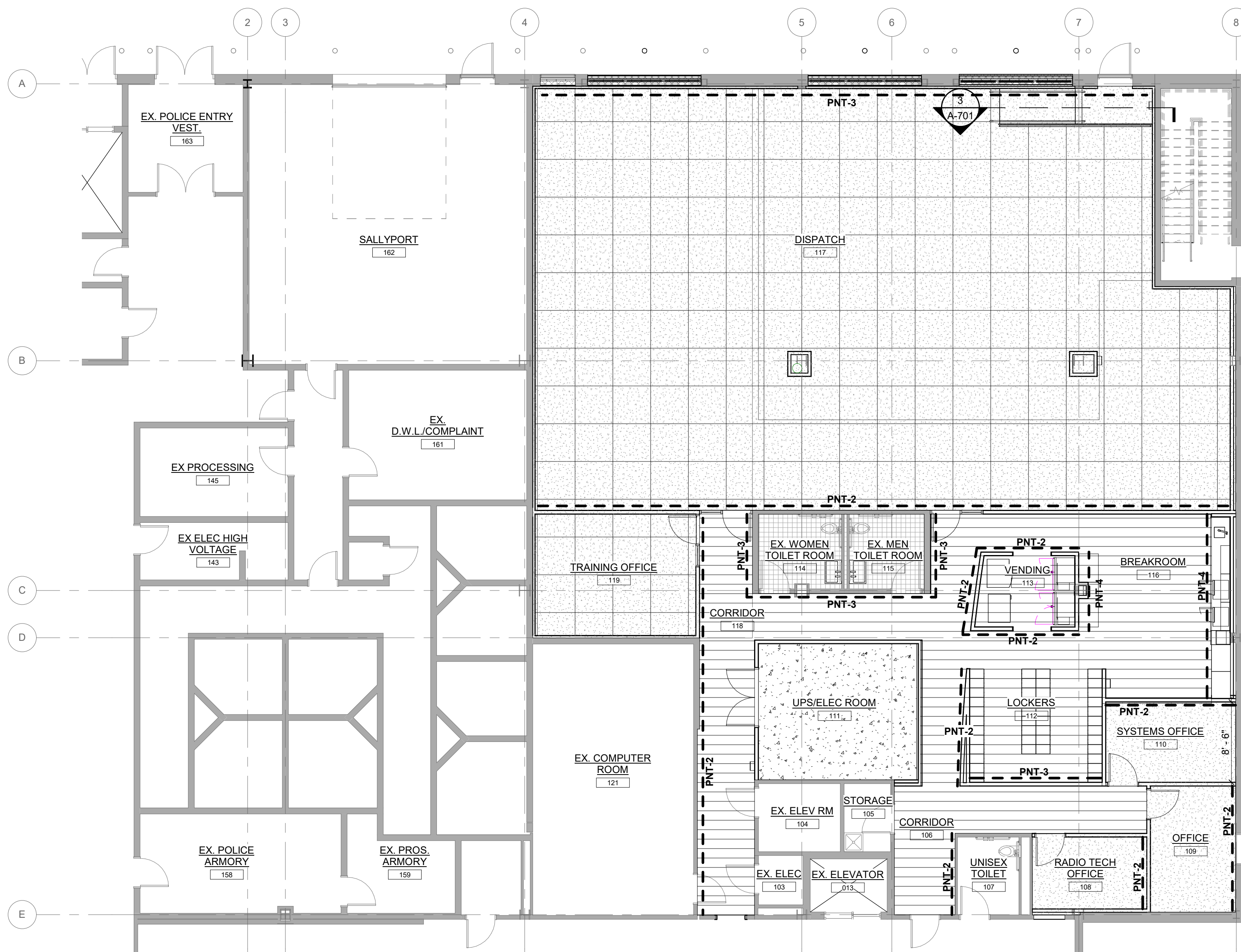
JOB NO.: 03009002  
DATE: 04/28/2020  
DRAWN: JRF  
CHECK: JMG  
SCALE: As indicated

SHEET NO.

**A-601**

ISSUED FOR BID - NOT FOR CONSTRUCTION 02/08/2021





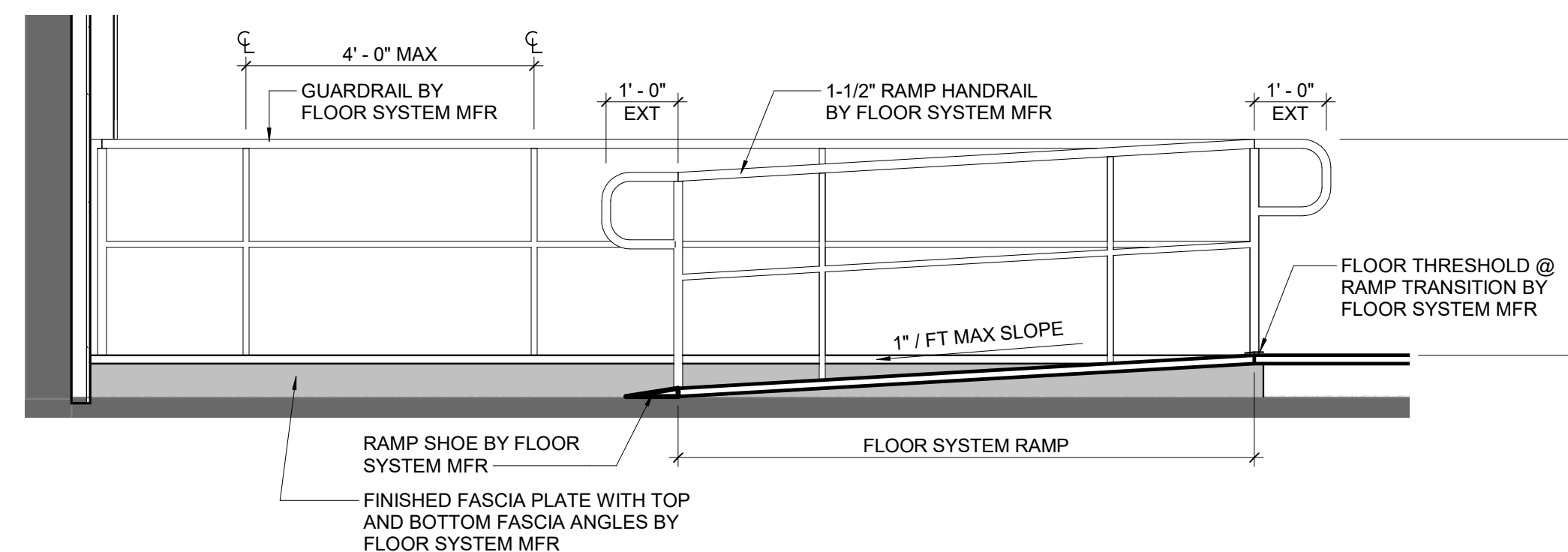
**1** FINISH FLOOR PLAN FROEHLICH BUILDING - PHASE 1  
1/8" = 1'-0"

**FLOOR ROOM FINISH SCHEDULE - PHASE 1**

ROOM NO.	ROOM NAME	FLOOR	BASE	WALL	CEILING	DOOR	FRAME	REMARKS
1st FLOOR								
106	CORRIDOR							
108	RADIO TECH OFFICE	CPT-1	RS-1	PNT-1/PNT-2	ACT			PNT-2 @ WEST WALL
109	OFFICE	CPT-1	RS-1	PNT-1/PNT-2	ACT			PNT-2 @ WEST WALL
110	SYSTEMS OFFICE	CPT-1	RS-1	PNT-1/PNT-2	ACT			PNT-2 @ SOUTH WALL
111	UPS/ELEC ROOM	CONC-S	RC-1	PNT-1	ACT			
112	LOCKERS	VT-1	RC-1	PNT-1/PNT-3	GYP CP-1			PNT-3 @ NORTH WALL
113	VENDING	VT-1	RC-1	PNT-1/PNT-4/PLAM-2	ACT/GYP CP-1			PNT-4 @ EAST AND WEST WALL, PLAM-1 @ CABINETS, PLAM-2 @ WEST WALL ABOVE COUNTER
114	EX. WOMEN TOILET ROOM	PT-1	PB-1	PWT	EXISTING GYP CP-1			
115	EX. MEN TOILET ROOM	PT-1	PB-1	PWT	EXISTING GYP CP-1			
116	BREAKROOM							
117	DISPATCH	CPT-1	RS-1	PNT-1/PNT-2/PNT-3	ACT			PNT-2 @ NORTH WALL, PNT-3 @ SOUTH WALL
118	CORRIDOR							
119	TRAINING OFFICE	CPT-1	RS-1	PNT	ACT			ON RAISED FLOOR SYSTEM
2nd FLOOR								
209	OPEN OFFICE AREA	EXISTING	*	PNT	*			MATCH EXISTING FINISHES
3rd FLOOR								
312	STORAGE CLOSET	EXISTING	*	PNT	*			MATCH EXISTING FINISHES

**FLOOR ROOM FINISH SCHEDULE - PHASE 2**

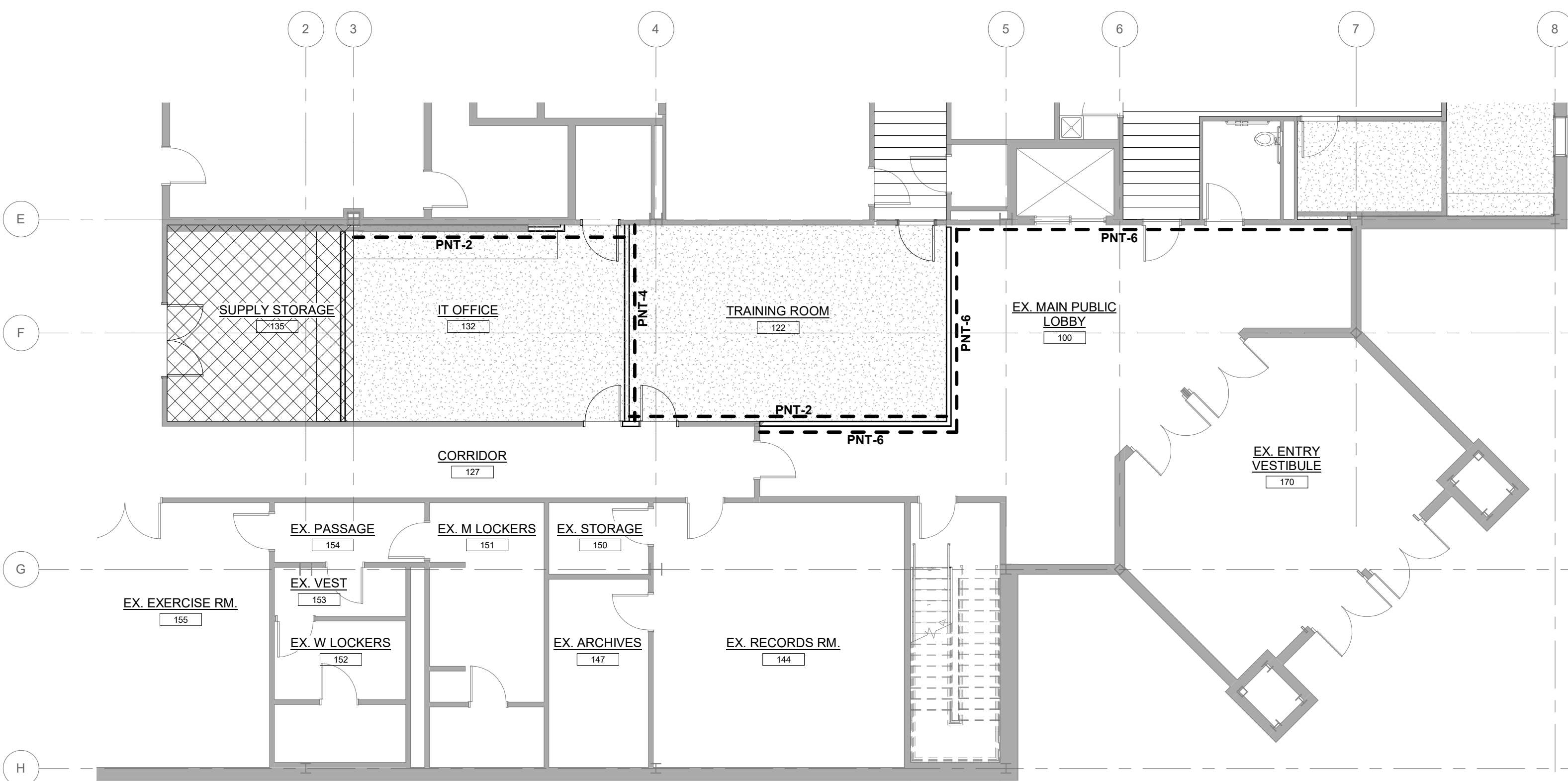
ROOM NO.	ROOM NAME	FLOOR	BASE	WALL	CEILING	DOOR	FRAME	REMARKS
1st FLOOR								
100	EX. MAIN PUBLIC LOBBY	EXISTING	*	PNT-6	-			MATCH EXISTING FINISHES
121	EX. COMPUTER ROOM							
122	TRAINING ROOM	CPT-1	RS-1	PNT-1/PNT-2/PNT-4	ACT			PNT-2 @ SOUTH WALL, PNT-4 @ WEST WALL
123	IT CLOSET							
127	CORRIDOR	EXISTING	*	PNT-6	EXISTING			MATCH EXISTING FINISHES
132	IT OFFICE	CPT-1	RS-1	PNT-1/PNT-2	ACT			PNT-2 @ NORTH WALL
135	SUPPLY STORAGE	CONC-S	RS-1	PNT-1	ACT			



**3** RAMP SECTION  
1/2" = 1'-0"

**FINISH MATERIAL SCHEDULE**

TAGS	DESCRIPTION	MANUFACTURER (OR EQUAL)	PRODUCT NAME (OR EQUAL)	MODEL NO. (OR EQUAL)	SIZE	COLOR	COMMENTS
BASE							
PB-1	PORCELAIN BASE	GARDEN STATE TILE	ALFALIX VALMALENCO BATTISCOPIA NERO	-	3"x24"	1224 NATURALE	-
RC-1	RUBBER BASE	ROPPE	RUBBER STRAIGHT TYPE TS PINNACLE	-	4" HIGH STANDARD TOE (COVE)	#123 CHARCOAL	USED AT NON-CARPET AREAS
RS-1	RUBBER BASE	ROPPE	RUBBER STRAIGHT TYPE TS PINNACLE	-	4" HIGH STANDARD TOE (STRAIGHT)	#123 CHARCOAL	USED AT CARPET AREAS
CEILING							
C-1	ACOUSTIC CEILING TILE	ARMSTRONG	ULTIMA 9'16" BEVELED REGULAR SUPRAFINE XL EXPOSED TEE GRID	1942	24"x24"	WHITE	-
CP-1	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX SEMI-GLOSS SW7004 SNOWBOUND	-
COUNTER TOP							
CT-1	SOLID SURFACE	KRION	ETNA	L905 G9	1-1/4" THICK	L905 G9	EASED EDGE AT BREAK ROOM 116
DOOR & TRIM							
LSG-1	PAINT	SHERWIN WILLIAMS	-	-	-	LATEX SEMI-GLOSS SW7004 SNOWBOUND	-
LSG-2	PAINT	-	-	-	-	-	MATCH EXISTING
WD	STAINED WOOD DOOR OIL BASED WOOD STAIN	-	-	-	-	COLOR TO MATCH EXISTING	ROLL-ON FOR 20 MIN. PENETRATION AND WIPE OFF. FINISH (2) COATS ZAR WATER BASED POLYURETHANE OR EQUAL. DRY FOR 24 HOURS.
FLOORING							
PT-1	PORCELAIN TILE	GARDEN STATE TILE	ALFALIX VALMALENCO VALVERO	-	12"x24"	1224 NATURALE	RUNNING BOND
CPT-1	CARPET TILE	MILLIKEN REMIX 2.0	FREESTLYE	FRS141-83	39.4"x39.4"	VINYL WITH FRENCH BLUE ARGOS	INSTALL MONOLITHIC, PVC FREE WELL BAC COMFORT PLUS CUSHION BACKING
CONC-S	SEALED CONCRETE	-	-	-	-	CLEAR	PROVIDE 2 COATS AS RECOMMENDED BY MANUFACTURER
VT-1	VINYL TILE	MILLIKEN	KOKUTAN	-	7"x48"	KOK145	5.0 MM THICK
LAMINATE							
PLAM-1		WILSONART				DESIGNER WHITE #D354-01 (GLASS)	
PLAM-2		ALTRO				NIGHTFALL 6R22	LAMINATE TO WALL SURFACE
WALL							
P-1	PAINT	BENJAMIN MOORE	LATEX PAINT	-	-	LINEN WHITE 912	EGGSHELL
PWT-1	PORCELAIN TILE	NASCO STONE & TILE	GOTHAM	-	12"x24"	LIGHT GREY MURETTO MATTE	MOSAIC, MESH-MOUNTED
PNT-1	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX EGGSHELL SW7004 SNOWBOUND	-
PNT-2	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX EGGSHELL SW7065 ARGOS	-
PNT-3	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX EGGSHELL SW7066 GRAY MATTERS	-
PNT-4	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX EGGSHELL SW 7067 CITYSCAPE	-
PNT-5	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	PILLAR WHITE	INTERIOR CMU WALLS, PREPRITE INTERIOR LATEX BLOCK FILLER PRIMER
PNT-6	PAINT	SHERWIN WILLIAMS	PROMAR 200 (VOC)	-	-	LATEX EGGSHELL TO MATCH EXISTING WALLCOVERING	SUBMIT TO ARCHITECT FOR APPROVAL



**2** FINISH FLOOR PLAN FROEHLICH BUILDING - PHASE 2  
1/8" = 1'-0"

**FINISH PLAN NOTES**

- PROVIDE AND INSTALL CEILING ACCESS PANELS AS MAYBE REQUIRED TO ACCESS EQUIPMENT, PIPING ABOVE THE GYPSUM BOARD CEILING. PAINT ACCESS DOOR TO MATCH CEILING COLOR.
- ALL RAMP AND STAIR HANDRAILS AND GUARDRAILS TO BE PAINTED.
- ALL EXPOSED STRUCTURE TO BE PAINTED.
- ALL PAINT AND WALL COVERINGS SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- PREPARE FLOOR PER MANUFACTURER'S RECOMMENDATIONS TO PROVIDE LEVEL AREA FOR FLOORING INSTALLATION AND LEVEL TRANSITIONS.
- DISTURBED FLOORS, WALLS, CEILINGS AND FINISHES SHALL BE PATCHED TO MATCH EXISTING AND/OR PATCHED TO RECEIVE NEW FINISHES SPECIFIED IN THE FINISH SCHEDULE, UNLESS OTHERWISE NOTED.
- GYP. BD. SURFACES TO BE PAINTED SHALL BE 3-COAT SYSTEM, EGGSHELL FINISH - 1 COAT PRIMER (0.9 MILS) AND 2 FINISH COATS (1.3 MILS EACH). METAL DOOR FRAMES AND TRIM SHALL BE 3-COAT SYSTEM, LATEX SEMI-GLOSS FINISH - 1 COAT PRIMER UNDER BODY (1.4 MILS) AND 2 FINISH COATS (1.2 MILS EACH). PAINT METAL FRAMES.
- WHENEVER NECESSARY TO OBTAIN REQUIRED RESULTS, A WHOLE WALL SHALL BE REFINISHED RATHER THAN SPOT FINISHING WHERE A PORTION OF FINISH HAS BEEN DAMAGED OR IS UNSATISFACTORY.
- MAKE EDGE OF PAINT ADJOINING OTHER MATERIALS OR COLORS SHARP AND CLEAN AND WITHOUT OVERLAP.
- MINIMUM DRYING SHALL COMPLY WITH THAT RECOMMENDED BY THE PAINT MANUFACTURERS INSTALLATION REQUIREMENTS. EACH COAT SHALL BE THOROUGHLY DRY BEFORE APPLICATION OF SUBSEQUENT COATS.
- PAINT AND PROVIDE NEW BASE BOTH SIDES OF ALL NEW PARTITIONS.
- METAL DOOR FRAMES AND TRIM SHALL BE 3-COAT SYSTEM - 1 COAT PRIMER UNDERBODY (1.4 MILS) AND 2 FINISH COATS (1.2 MILS EACH).
- FLOORING PREPARATIONS SHALL BE ACCORDING TO MANUFACTURER'S INSTALLATION SPECIFICATIONS. SUBSTRATE MUST BE DRY, CLEAN, SMOOTH AND FREE FROM PAINT, VARNISH, WAX, OIL, SOLVENTS, AND OTHER FOREIGN MATTER.
- CABINET HARDWARE - PULLS SHALL BE SATIN NICKEL EUROPEAN STYLE BAR PULL 8-3/4" LONG.

**FINISH FLOOR TYPE**

- VT-1 VINYL 1
- VT-2 VINYL 2
- CPT-1 CARPET
- CPT-2 CARPET ON RAISED FLOOR
- PT-1 PORCELAIN TILE
- CONC-S SEALED CONCRETE

**FINISH LEGEND**

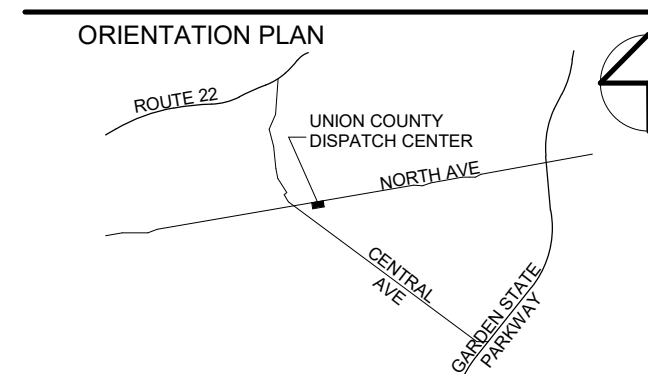
- ACT ACOUSTICAL CEILING TILE
- CONC-S SEALED CONCRETE
- CP CEILING PAINT
- CPT CARPET
- CT COUNTERTOP
- GYP GYPSUM BOARD CEILING
- LSG LATEX SEMI-GLOSS
- PB PORCELAIN BASE
- PNT PAINT
- PT PORCELAIN TILE
- PWT PORCELAIN WALL TILE
- PLAM PLASTIC LAMINATE
- RC(S) RUBBER COVE (STRAIGHT)
- VT VINYL TILE

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License no. 021300

ISS/REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV1

CLIENT

CONSULTANT



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67A MOUNTAIN BOULEVARD EXTENSION  
P.O. Box 4039  
WARREN, NEW JERSEY 07059  
TEL: 732.560.9700

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SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

County of Union



PROJECT  
**UNION COUNTY DISPATCH CENTER EXPANSION**

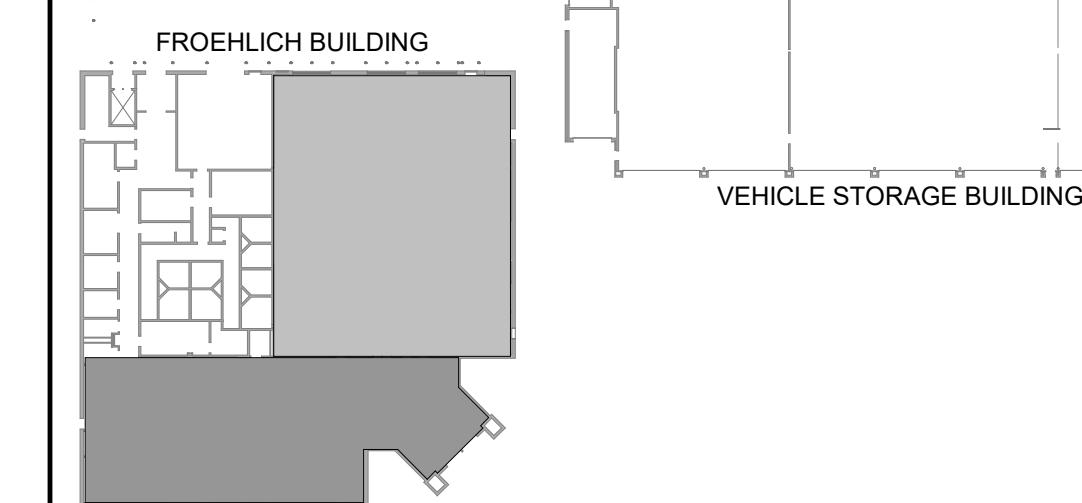
FROEHLICH BUILDING  
NORTH AVENUE  
WESTFIELD, NEW JERSEY

SHEET NAME

FINISH PLAN

JOB NO.: 03008002  
DATE: 04/28/2020  
DRAWN: MNY  
CHECK: JMG  
SCALE: As indicated

SHEET NO.



KEY PLAN

A-701

02/08/2021 - ISSUED FOR BID - NOT FOR CONSTRUCTION















## FIRE PROTECTION SYMBOLS LEGEND

FIRE PROTECTION SYMBOLS		SPRINKLER SYMBOLS		FIRE PROTECTION TAGS	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	FIRE FLOOR CONTROL VALVE		ELBOW TURNED UP		TIE IN CONNECTION TO EXISTING
	FIRE DEPT. CONNECTION		ELBOW TURNED DOWN		DISCONNECT FROM EXISTING
	FIRE HOSE VALVE		BOTTOM PIPE CONNECTION		ROOM TAG
	OS&Y VALVE		TOP PIPE CONNECTION		ROOM TAG W/ AREA
	BALL VALVE		NEW CONCEALED SPRINKLER HEAD		PIPE TYPE SIZE TAG
	CHECK VALVE		NEW SIDEWALL SPRINKLER HEAD		PIPE TYPE TAG
	GATE VALVE		PENDENT SPRINKLER HEAD		PIPE RISER TAG
	CAP		PENDENT SPRINKLER HEAD WITH GUARD		BOTTOM OF PIPE ELEVATION TAG
	DEMOLISHED PIPING		UPRIGHT SPRINKLER HEAD		PIPE CENTERLINE ELEVATION TAG
	NEW SYSTEM PIPING		UPRIGHT SPRINKLER HEAD WITH GUARD		

NOTE: ALL SYMBOLS ARE NOT NECESSARILY APPLICABLE TO THIS PROJECT

## VIEW TAGS

	PLAN KEYNOTE GENERIC
	COLUMN GRID HEAD
	DETAIL SECTION
	VIEW TITLE
	VIEW TITLE
	REVISION TAG

NOTE: NOT ALL SYMBOLS SHOWN IN LEGEND MAY BE USED.

## SEISMIC REQUIREMENTS

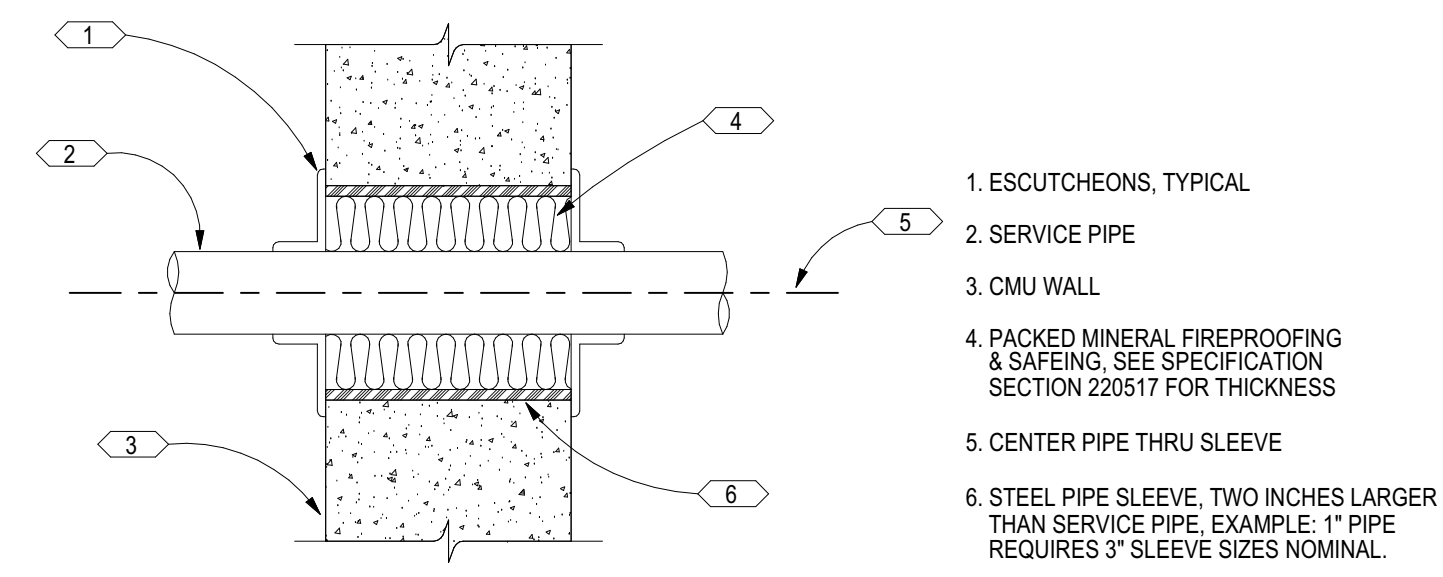
Occupancy Category: Seismic Importance Factor: II  
 Seismic Use Group: S1  
 Mapped Spectral Response Acceleration:  
 S1: 0.058  
 S1: 0.058  
 Site Class: D  
 Spectral Response Coefficient:  
 Sds: 0.282  
 Sd1: 0.093  
 Seismic Design Category: C  
 Systems with 1p: Smoke removal, exhaust and fresh air ventilation systems

## GENERAL NOTES

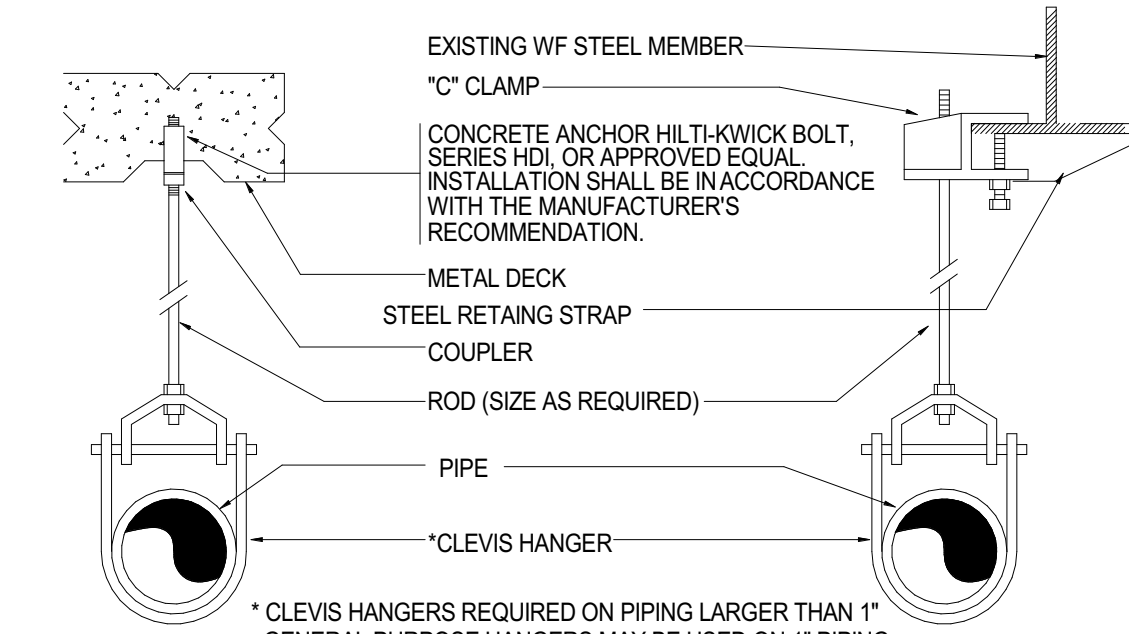
- THE NEW AND EXISTING SPRINKLER SYSTEM IS AN AUTOMATIC WET PIPE TYPE, FOR ALL AREAS INDICATED ON DRAWINGS.
- THE DRAWINGS, DIVISION 0-BIDDING & CONTRACT FORMS, AND DIVISION 1, GENERAL REQUIREMENTS, GOVERN THIS WORK. WHERE ITEMS OF GENERAL CONDITIONS AND REPEATED HEREIN, IT IS INTENDED TO QUALIFY OR TO CALL PARTICULAR ATTENTION TO THEM. IT IS NOT INTENDED THAT ANY OTHER PARTS OF THE GENERAL CONDITIONS SHALL BE ASSUMED TO BE OMITTED.
- THE SPRINKLER SYSTEM SHALL BE DESIGNED AND INSTALLED IN STRICT CONFORMANCE WITH ALL LOCAL AUTHORITIES HAVING JURISDICTION AND WITH THE LATEST APPLICABLE INTERNATIONAL BUILDING CODES, NFPA STANDARDS AND REGULATIONS.
- REFER TO ARCHITECTURAL DRAWINGS FOR EXACT ROOM LAYOUTS, ROOM DIMENSIONS, CEILING HEIGHTS, REFLECTED CEILING PLAN FOR COORDINATION OF SPRINKLER HEAD LOCATIONS, BUILDING CONSTRUCTION AND ALL OTHER ARCHITECTURAL AND STRUCTURAL DETAILS IMPACTING INSTALLATION OF THE FIRE PROTECTION SYSTEM.
- PRIOR TO SUBMISSION OF THE BID, THE CONTRACTOR SHALL VISIT THE JOB SITE TO ASCERTAIN THE ACTUAL FIELD CONDITIONS AS THEY RELATE TO DISCREPANCIES, IF ANY, SHALL BE BROUGHT TO THE ARCHITECTS AND ENGINEER'S ATTENTION PRIOR TO SUBMISSION OF BID. IF NOT RESOLVED IN TIME, DISCREPANCIES SHALL BE WRITTEN AS QUALIFICATIONS IN THE BID.
- PRIOR TO SUBMISSION OF THE FORMAL BID, THE CONTRACTOR SHALL REVIEW ALL DRAWINGS OF THE ENTIRE PROJECT INCLUDING GENERAL CONSTRUCTION, STRUCTURAL, ELECTRICAL, MECHANICAL, PLUMBING AND SPRINKLER SYSTEMS AND SHALL NOTIFY THE GENERAL CONTRACTOR OF ANY ASSOCIATED FIRE PROTECTION WORK WHICH IS INDICATED OR IMPLIED IN OTHER SECTIONS OF THE PROJECT.
- THE PLANS SHOW THE GENERAL LOCATION AND ARRANGEMENT OF SPRINKLER HEADS, RISER AND FEED MAIN LOCATIONS ONLY. THE CONTRACTOR SHALL DESIGN AND INSTALL PIPING TO CONNECT TO THE FIRE PROTECTION SYSTEM SERVICE. CONTRACTOR IS TO DETERMINE PRESSURE AND FLOW REQUIREMENTS FOR THE FIRE PROTECTION SYSTEM. ACTUAL RUN OF PIPING SHALL BE AS REQUIRED BY FIELD CONDITIONS. THE CONTRACTOR SHALL INCLUDE ALLOWANCES IN THE BID FOR POTENTIAL CHANGES TO THE SYSTEM DUE TO HYDRAULIC CALCULATIONS AND TO COORDINATE WITH OTHER TRADE SECTIONS.
- CONTRACTOR SHALL PREPARE HYDRAULIC CALCULATIONS IN ACCORDANCE WITH NFPA 13, 2016, INSURANCE UNDERWRITERS REQUIREMENTS, AND SUBMIT WITH SHOP DRAWINGS. DRAWINGS AND HYDRAULIC CALCULATIONS MUST BE SIGNED AND SEALED BY A STATE OF NEW JERSEY LICENSED PROFESSIONAL ENGINEER.
- DESIGN CONDITIONS:  
 HAZARD: LIGHT HAZARD (0.1 GPM / SQ. FT. DENSITY - MAX. 225 SQ. FT. PER SPR. HEAD); DISPATCH 001 - FIRE ACTION SYSTEM  
 BREAK ROOM 002, LOCKERS 003, RADIO TECH OFFICE 004, OFFICE 007, TRAINING OFFICE 009, SYST. OFFICE 016, TRAINING ROOM 4 & IT OFFICE 5 - WET SPRINKLER SYSTEM  
 ORDINARY HAZARD GROUP 2 (0.20 GPM / SQ. FT. DENSITY - MAX. 130 SQ. FT. PER SPR. HEAD); STORAGE 6 & SUPPLY STORAGE 105 - WET SPRINKLER SYSTEM; UPS/ELECTRICAL ROOM 009 - FIRE ACTION SYSTEM.  
 SYSTEM TYPES: WET AND PRE-ACTION.  
 MOST HYDRAULICALLY REMOTE AREA: 1,500 SQ. FT. (WET) & 1,950 SQ. FT. (DRY/PRE-ACTION)  
 HOSE ALLOWANCE: 250 GPM
- SCOPE OF WORK ALSO INCLUDES REMOVAL AND REPLACEMENT OF SPRINKLER HEADS AND PIPING TO FACILITATE INSTALLATION OF NEW HVAC DUCTWORK. REFER TO MECHANICAL DRAWINGS FOR EXTENT OF WORK.
- CONTRACTOR TO OBTAIN COPY OF CURRENT (WITHIN 6 MONTHS) HYDRANT FLOW TEST RESULTS BEFORE PROCEEDING WITH THE HYDRAULIC CALCULATIONS.
- OBTAIN ALL APPROVALS BEFORE STARTING INSTALLATION. CONTRACTOR SHALL OBTAIN APPLICATIONS, FILE AND PAY FOR ALL PERMITS, INSPECTIONS AND APPROVALS.
- ALL CONSTRUCTION WORK SHALL BE COORDINATED WITH GENERAL CONTRACTOR.
- ANY NECESSARY WATER SHUT-OFFS SHALL BE SO ARRANGED AS TO CAUSE MINIMUM DISRUPTION OF SERVICES TO THE REST OF THE BUILDING AND SHALL BE SCHEDULED AND APPROVED BY GENERAL CONTRACTOR. OWNER'S REPRESENTATION AND OWNER'S INSURANCE UNDERWRITER PRIOR TO THE START OF WORK.
- FIRE PROTECTION SYSTEM OUTSIDE THE AREAS UNDER CONSTRUCTION SHALL BE MAINTAINED IN SERVICE AT ALL TIMES.
- ALL SPRINKLER SYSTEM SHUTDOWNS REQUIRED FOR THE INSTALLATION OF NEW WORK AND/OR REMOVAL OF OLD WORK IS TO BE COORDINATED WITH THE OWNER'S REPRESENTATION, THE GENERAL CONTRACTOR, OWNER'S REPRESENTATION AND BUILDING AND MONITORING SERVICES.
- COORDINATE FIRE PROTECTION WORK WITH PLUMBING, HVAC, AND ELECTRICAL TRADE CONTRACTORS FOR CLEARANCES, ACCESS AND STRUCTURAL INTERFERENCE PRIOR TO INSTALLATION OF SPRINKLER SYSTEM. SHOULD ANY CONFLICTS OCCUR DURING CONSTRUCTION, THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE AT HIS OWN EXPENSE, FOR RESOLVING THE CONFLICTS BY REMOVING AND RELOCATING ANY FIRE PROTECTION SYSTEM COMPONENTS AS ARE NECESSARY TO RESOLVE THE CONFLICTS.
- ROUTE NEW PIPING TO CLEAR EXISTING AND NEW SERVICES AND EQUIPMENT. ALL SPRINKLER PIPING, UNLESS OTHERWISE NOTED, SHALL BE CONCEALED ABOVE CEILING OR WITHIN SOFFIT AREAS.
- FIRE-STOP ALL WALL AND FLOOR PENETRATIONS AS REQUIRED.
- ALL SPRINKLER PIPING SHALL BE INSTALLED SO THAT IT CAN BE THOROUGHLY DRAINED AT ALL LOW POINTS; ALL DRIPS AND DRAINS SHALL CONFORM TO NFPA-13, 2016.
- SPRINKLER PIPING AND FITTINGS:  
 WET SYSTEM:  
 A. PIPE: BLACK CARBON STEEL, ASTM A 53 OR ASTM A 795, SCHEDULE 40  
 B. FITTINGS: BLACK MALLEABLE IRON, OR BLACK CAST IRON, THREADED, 150 LB., ANSI B16.3  
 C. JOINT: TEFLON TAPE OR TEFLON COMPOUND.  
 PRE-ACTION SYSTEM:  
 A. PIPE: GALVANIZED STEEL PIPE, ASTM A 53 / A 53 M  
 B. FITTINGS: THREADED OR GROOVED-JOINT  
 C. JOINT: APPLY TEFLON TAPE FOR THREADED FITTING OPTION
- SPRINKLER HEADS:  
 A. MATCH EXISTING, OR PROVIDE CONCEALED SPRINKLER HEAD - RELIABLE MODEL, GS-99 QUICK RESPONSE 165 DEG F CONCEALED SPRINKLER HEAD, 1/2" ORIFICE, K-FACTOR 5.8 WHITE 135 DEG F COVER PLATE SPRINKLER SIN #R4M15 (OR EQUAL)  
 B. ALL SPRINKLER HEADS SHALL BE OF THE PROPER TEMPERATURE RATING FOR THE LOCATION IN WHICH THEY ARE INSTALLED.
- SPRINKLER HEAD SPACING, LOCATION AND POSITION TO BE IN ACCORDANCE WITH NFPA-13, 2016.
- ALL SPRINKLER HEADS SHALL BE INSTALLED IN THE CENTER OF CEILING TILES OR CENTER OF HALF OF A TILE, UNLESS OFF-CENTER LOCATION IS REQUIRED TO SATISFY THE CODE SPACING LIMITATIONS.
- TEST SYSTEM IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA-13, 2016 AND ALL APPLICABLE CODES AND REGULATIONS.
- ALL FIRE PROTECTION PIPING, EQUIPMENT AND MATERIALS SHALL BE UL-LISTED AND FM-APPROVED.
- IN MECHANICAL AREAS AND AREAS WHERE THERE IS NO CEILING, THE CONTRACTOR SHALL DETERMINE AND INCLUDE IN THE BID ANY ADDITIONAL SPRINKLER HEADS REQUIRED TO COVER AREAS UNDER DUCTWORK OR OTHER OBSTRUCTIONS GREATER THAN FOUR (4) FEET IN WIDTH.
- TEMPORARY CONSTRUCTION BARRIERS SHALL NOT AFFECT EXISTING SPRINKLER COVERAGE AROUND THE AREA OF WORK. IF TEMPORARY CONSTRUCTION BARRIERS DO AFFECT EXISTING SPRINKLER COVERAGE AROUND THE AREA OF WORK, CONTRACTOR OR OWNER SHALL PROVIDE A FIRE WATER DURING CONSTRUCTION.

## DRAWING LIST - FIRE PROTECTION

SHEET NUMBER	SHEET NAME
F-001	FIRE PROTECTION - SYMBOLS, NOTES, ABBREVIATIONS AND DETAILS
F-101	FIRE PROTECTION - CONSTRUCTION PLANS
F-501	FIRE PROTECTION - CLEAN AGENT FIRE SUPPRESSION SYSTEM DETAILS



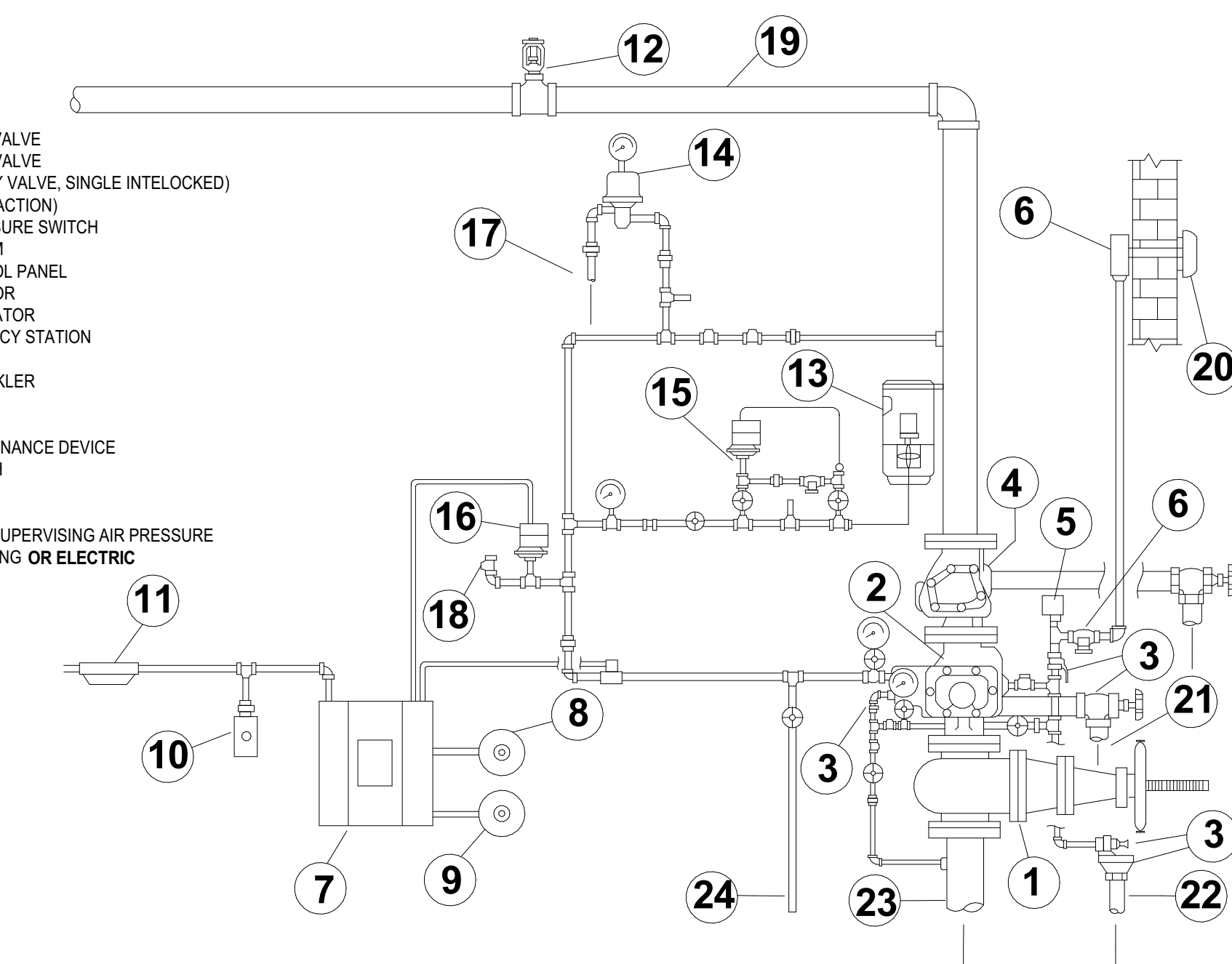
**4 PIPE SLEEVE THRU WALL DETAIL**  
NTS



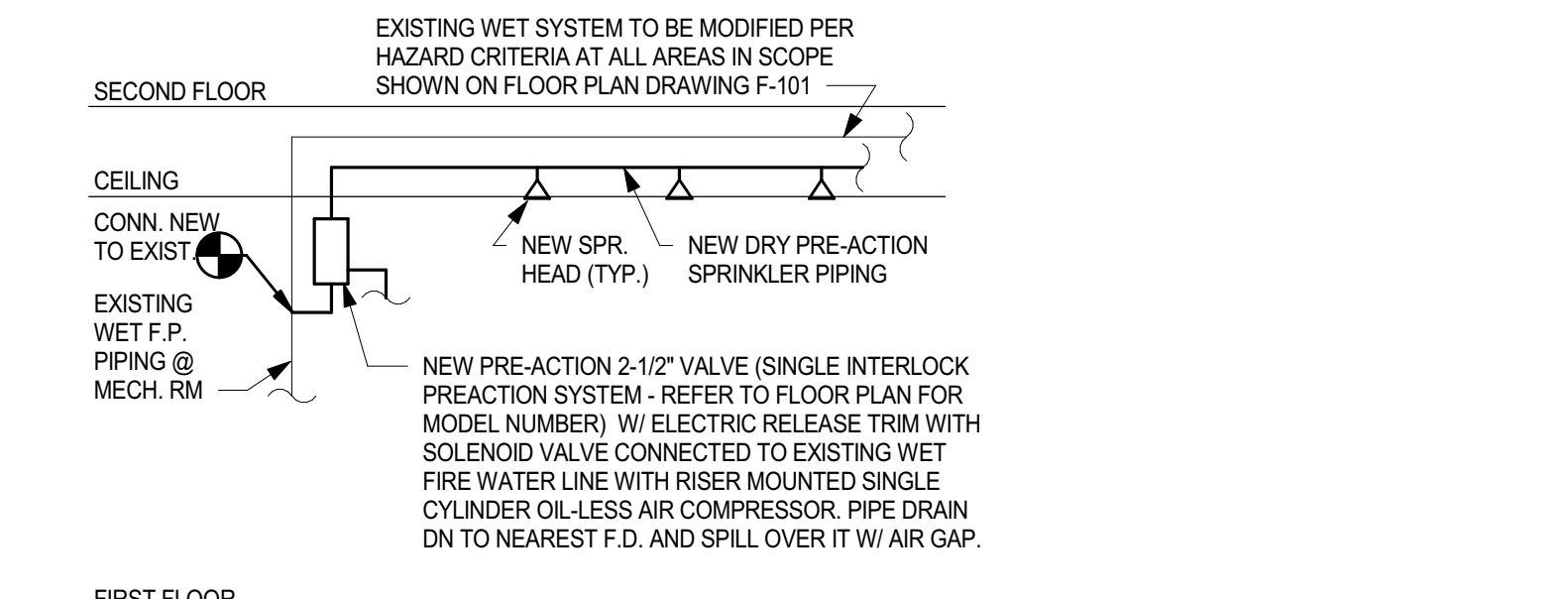
MAXIMUM DISTANCE BETWEEN HANGERS										
NOMINAL PIPE SIZE (in.)	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
STEEL PIPE EXCEPT THREADED LIGHTWALL	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0
COPPER TUBE	8-0	10-0	10-0	12-0	12-0	15-0	15-0	15-0	15-0	15-0

ALL HANGERS TO MEET OR EXCEED NFPA REQUIREMENTS

**5 TYPICAL HANGER DETAIL**  
NTS



**6 PRE-ACTION SYSTEM VALVE DETAIL**  
NTS



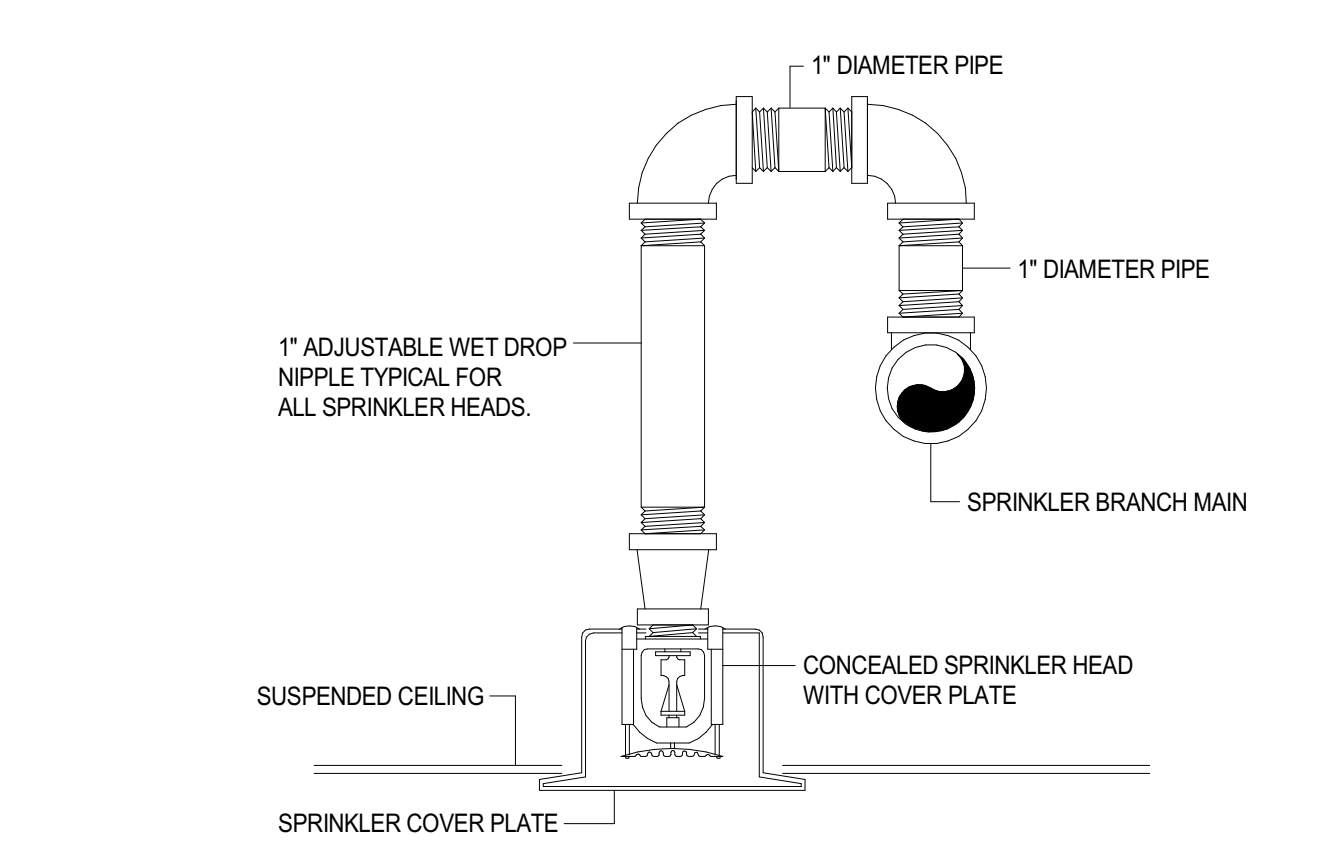
**7 PRE-ACTION SYSTEM RISER DIAGRAM**  
NTS

## ABBREVIATIONS\_FIRE PROTECTION

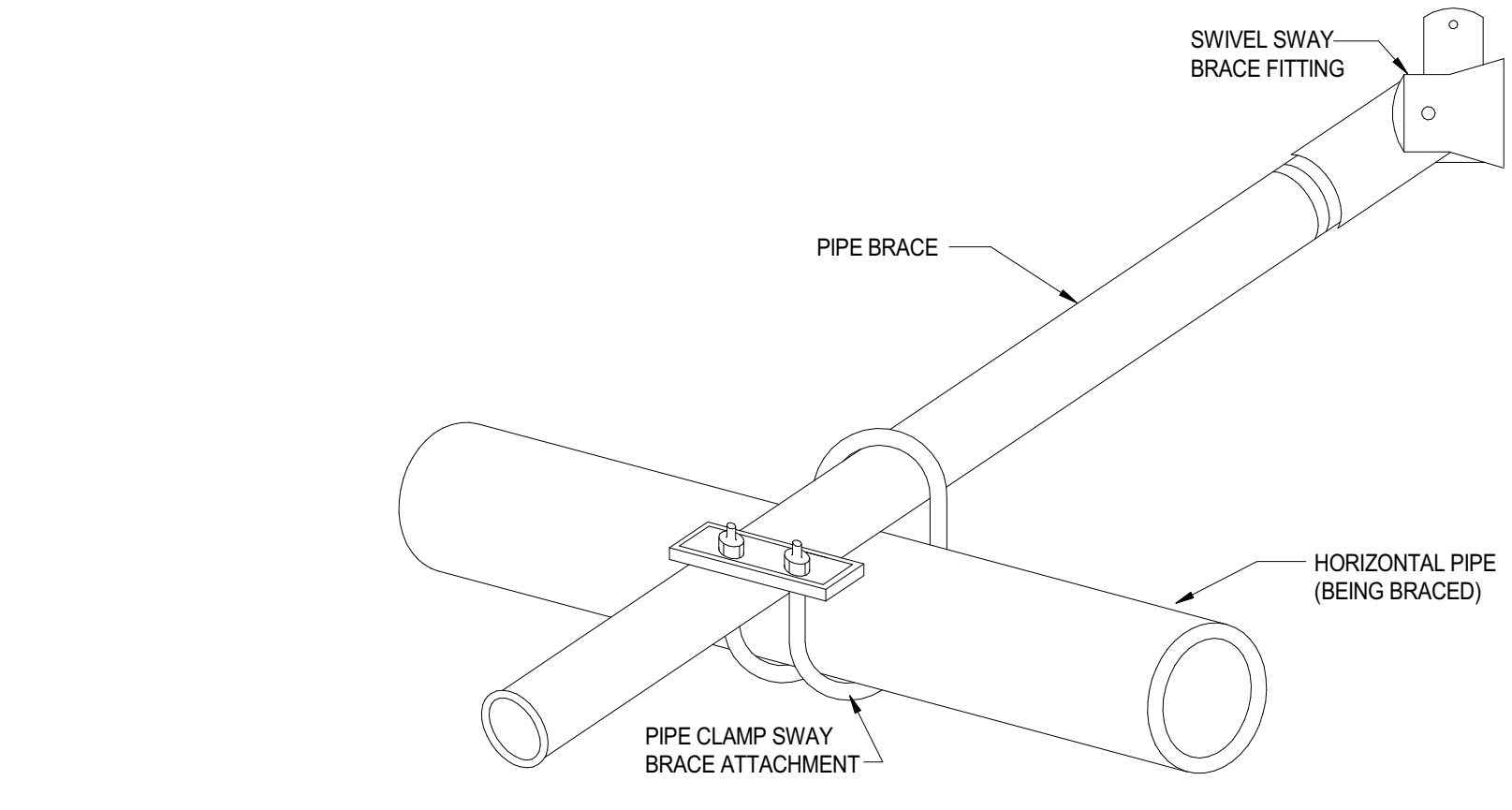
SYMBOL	DESCRIPTION
MEFP	MECHANICAL EQUIPMENT ROOM
MEFP	MECHANICAL EQUIPMENT ROOM
AFF	ABOVE FINISHED FLOOR
AD	ACCESS DOOR
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AWG	AMERICAN WIRE GAGE
AMP	AMPERE
AD	AREA DRAIN
ATM	AIR TRAP
ASD	AUTOMATIC SHUT OFF
ACV	AUTOMATIC CHECK VALVE
AVG	AVERAGE
BPA	BACKFLOW PREVENTER ASSEMBLY
BDP	BOTTOM OF PIPE
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BAS	BUILDING AUTOMATION SYSTEM
BMS	BUILDING MANAGEMENT SYSTEM
CLG	CEILING
CHK	CHECK
CKT	CIRCUIT
COL	COLUMN
CD	CONDENSATE DRAIN
CU FT	CUBIC FEET
' DEG	DEGREES
'C	DEGREES CELSIUS
'F	DEGREES FAHRENHEIT
D	DEPTH, DRAIN
Ø DIA, DIM	DIAMETER
Ø DIA, DIM	DIAMETER
ID	DIAMETER, INSIDE
OD	DIAMETER, OUTSIDE
DN	DOWN (PENETRATES FLOOR SLAB)
DFJ	DRAINAGE FIXTURE UNIT
DWG	DRAWING
EA	EACH EXHAUST AIR
%EFF	EFFICIENCY, PERCENTAGE
EWV	ELECTRIC WATER COOLER
EL	ELEVATION
FM	FACTORY MUTUAL
FT HD	FEET HEAD
' FT	FEET, FOOT
FPT	FEMALE PIPE THREAD
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FHVC	FIRE HOSE VALVE CABINET
FS	FIRE STANDPIPE
FCV	FLOOR CONTROL VALVE ASSEMBLY
FLA	FULL LOAD AMP
GA	GAGE, GAUGE
GAL	GALLONS
GPM	GALLONS PER MINUTE
GC	GENERAL CONTRACTOR
HD	HEAD, HEAT DETECTOR
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
H, HT	HEIGHT
HZ	HERTZ (FREQUENCY)
HP	HORSEPOWER, HEAT PUMP
H, CLNG	HUNG CEILING

## ABBREVIATIONS\_FIRE PROTECTION

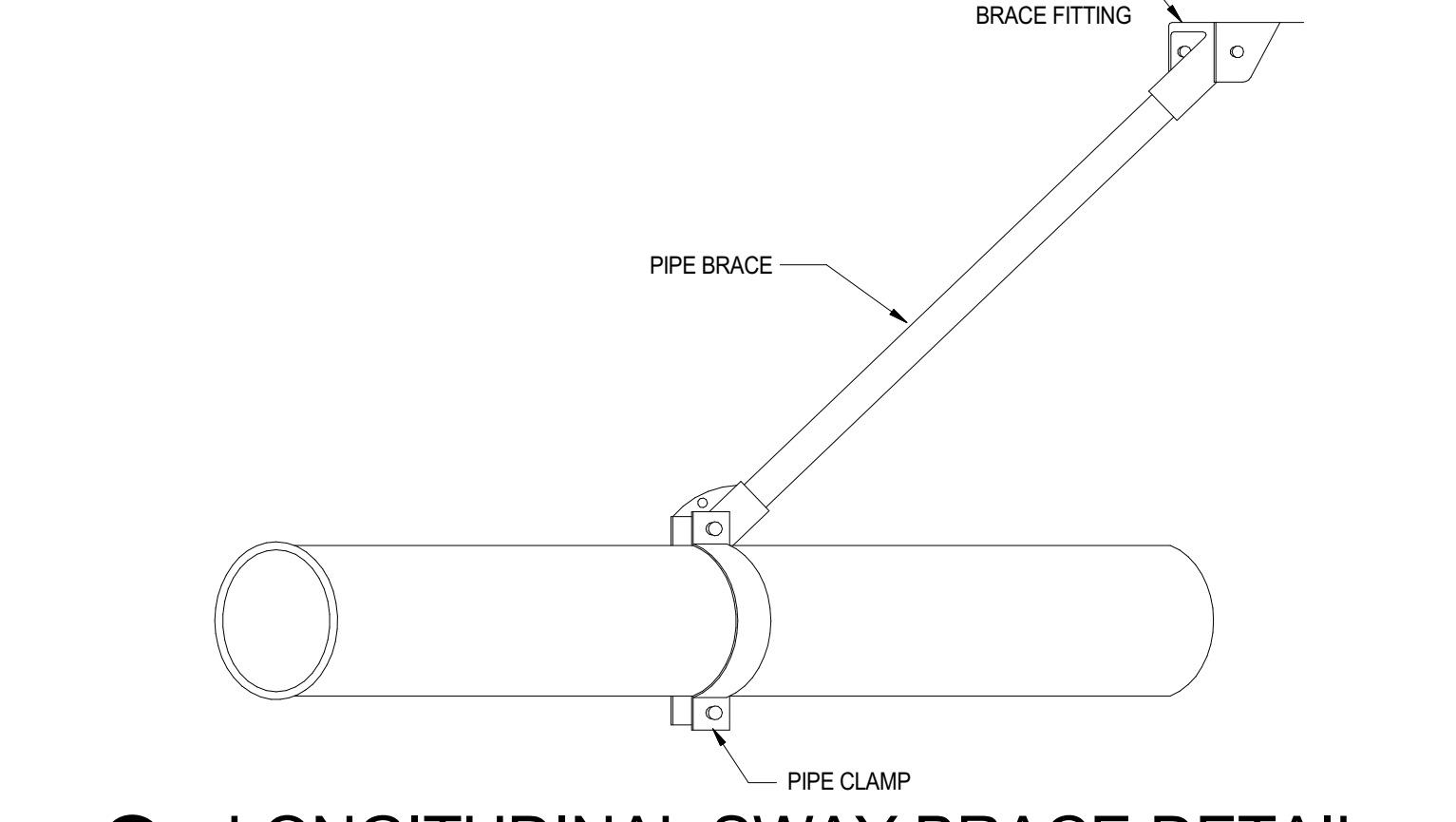
SYMBOL	DESCRIPTION
" IN	INCHES
IW	INDIRECT WASTE
IPS	IRON PIPE SIZE
L, LG	LENGTH
LF	LINEAR FEET
LIQ	LIQUID
MPT	MALE PIPE THREAD
MFR	MANUFACTURER
MAX	MAXIMUM
MER	MECHANICAL EQUIPMENT ROOM
MIN	MINIMUM
MHP	MOTOR HORSEPOWER
NEMA	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NPS	NATIONAL PIPE STANDARD
NPT	NATIONAL PIPE THREAD
NCM	NOMINAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NA	NOT APPLICABLE
NIS	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OCCUP	OCCUPANCY
OSHA	OCCUPATIONAL SAFETY & HEALTH AGENCY
OS&Y	OUTSIDE SCREW & YOKE GATE VALVE
PH	PHASE (ELECTRICAL)
PA	PIPE ANCHOR
PG	PIPE GUIDE
PS	PIPE SUPPORT
LBS	POUND
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSIG	POUNDS PER SQUARE INCH, GAUGE
P, PRESS	PRESSURE
P, PD	PRESSURE DROP, DIFFERENTIAL PRESSURE
RZBPA	REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY
REQD	REQUIRED
RPM	REVOLUTIONS PER MINUTE
RM	ROOM
SF	SAFETY FACTOR, SUPPLY FAN
SCH	SCHEDULE
S	SECOND
SPEC	SPECIFICATION
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
TS	TAMPER SWITCH
T, TEMP	TEMPERATURE
TYP	TYPICAL
UL	UNDERWRITER'S LABORATORY
UNLESS OTHERWISE NOTED	UNLESS OTHERWISE NOTED
UP	UP (PENETRATES FLOOR SLAB)
V	VALVE, VENT, VOLTS
VEL	VELOCITY
WC	WATER COLUMN, WATER CLOSET
WFS	WATER FLOW SWITCH
WS	WATER GAUGE
W	WATT, WIDTH, WASTE
WT	WEIGHT, WATER TREATMENT
Z	ZONE



**1 CONCEALED SPRINKLER HEAD DETAIL**  
NTS



**2 LATERAL SWAY BRACE DETAIL**  
NTS

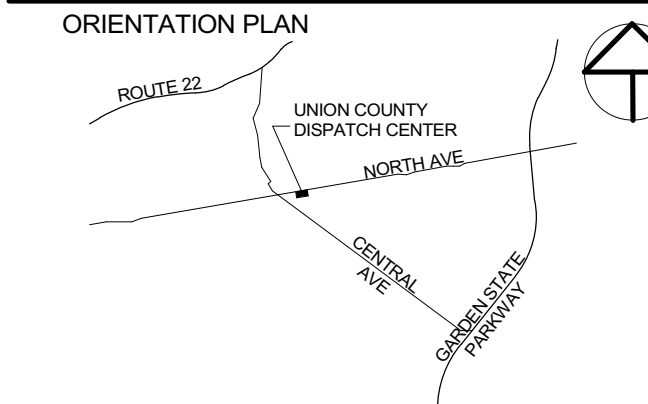


**3 LONGITUDINAL SWAY BRACE DETAIL**  
NTS

ISS / REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV 1

CLIENT

CONSULTANT



PAULUS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
 P. O. Box 4039  
 WARREN, NEW JERSEY 07059  
 TEL: 732.560.9700

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**Albert W. Hadam**  
 Professional Engineer - New Jersey  
 License No. 51200

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

**Union County Div of Engineering**

PROJECT  
**UNION COUNTY DISPATCH CENTER AREA EXPANSION**  
 FROELICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME  
**FIRE PROTECTION - SYMBOLS, NOTES, ABBREVIATIONS AND DETAILS**

JOB NO.: 03090002  
 DATE: 08/31/2020  
 DRAWN: DDZ  
 CHECK: AH  
 SCALE: As Indicated  
 SHEET NO.

**F-001**























### HVAC SYMBOL LEGEND

PIPE TYPE TAGS				PIPING SYMBOLS				DUCTWORK SYMBOLS				MECHANICAL TAGS			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
V	ATMOSPHERIC VENT		ANGLE GATE VALVE		SELF-CONTAINED PRESSURE REGULATING VALVE		CONCENTRIC REDUCER		AXIAL FLOW FAN		FIRE DAMPER & ACCESS DOOR		ELECTRIC DUCT HEATER		THE IN CONNECTION TO EXISTING
CHGSR	CHILLED GLYCOL SUPPLY RETURN		ANGLE GLOBE VALVE		SOLENOID VALVE		ECCENTRIC REDUCER FLAT ON BOTTOM		CENTRIFUGAL FAN		SMOKE DAMPER & ACCESS DOOR		TERMINAL UNIT		DISCONNECT FROM EXISTING
CHWSR	CHILLED WATER SUPPLY RETURN		BALANCING VALVE WITH FLOW TAPS		THREE-WAY VALVE		ECCENTRIC REDUCER FLAT ON TOP		PROPELLER FAN		MANUAL VOLUME DAMPER		HUMIDIFIER		DIFFUSER TAG
CA	COMPRESSED AIR		BALL VALVE		TRIPLE DUTY VALVE		PIT PLUG		DIRECTION OF FLOW IN DUCTWORK		STANDARD DUCT BRANCH		UNIT HEATER HORIZONTAL DISCHARGE		MECHANICAL EQUIPMENT TAG
CND	CONDENSATE DRAIN		BUTTERFLY VALVE		VACUUM BREAKER		UNION		DUCT SIZE, IN INCHES		OPEN END DUCT WITH WIRE MESH SCREEN		SUPPLY AIR DUCT DOWN		ROOM TAG
CWSR	CONDENSER WATER SUPPLY RETURN		CHECK VALVE		THERMOMETER		FLANGED CONNECTION		SUPPLY DUCT SECTION		EXHAUST/RETURN AIR		SUPPLY AIR DUCT UP		PIPE TYPE SIZE TAG
D	DRAIN		STOP CHECK VALVE		PRESSURE GAUGE w/ VALVE		MANUAL AIR VENT		RETURN DUCT SECTION		SUPPLY AIR		RETURN DUCT DOWN		PIPE TYPE TAG
HHGSR	HEATING HOT GLYCOL SUPPLY RETURN		DIAPHRAGM VALVE		2-WAY CONTROL VALVE		AUTOMATIC AIR VENT		EXHAUST DUCT SECTION		SQUARE RECTANGULAR CEILING SUPPLY DIFFUSER (4-WAY BLOW)		RETURN DUCT UP		PIPE RISER TAG
HHWSR	HEATING HOT WATER SUPPLY RETURN		GATE VALVE, ISOLATION VALVE		3-WAY CONTROL VALVE		PIPE ALIGNMENT GUIDE		CHANGE OF ELEVATION, RISE (R) OR DROP (D)		SQUARE RECTANGULAR CEILING SUPPLY DIFFUSER (2-WAY BLOW)		EXHAUST DUCT DOWN		THERMOSTAT SYMBOL TAG
HPC	HIGH PRESSURE CONDENSATE		GLOBE VALVE		CAP		PIPE ANCHOR		FLEXIBLE CONNECTION		SQUARE RECTANGULAR CEILING SUPPLY DIFFUSER (2-WAY BLOW)		EXHAUST DUCT UP		HUMIDISTAT
HPS	HIGH PRESSURE STEAM		PRESSURE REGULATING VALVE		BOTTOM CONNECTION		BALL JOINT		FLEXIBLE DUCT		SQUARE RECTANGULAR CEILING SUPPLY DIFFUSER (1-WAY BLOW)		EXISTING DUCTWORK OR EQUIPMENT TO REMAIN		CO2 SENSOR
LPC	LOW PRESSURE CONDENSATE		LOCK SHIELD VALVE		TOP CONNECTION		EXPANSION JOINT		DUCT TRANSITION		ROUND CEILING DIFFUSER		EXISTING DUCTWORK OR EQUIPMENT DEMOLISHED		TOP OF DUCT ELEVATION TAG
LPS	LOW PRESSURE STEAM		OS&Y VALVE		90° ELBOW		EXPANSION LOOP		RADIUS TYPE ELBOW		LINEAR DIFFUSER		ELECTRIC MOTOR		BOTTOM OF DUCT ELEVATION TAG
MPC	MEDIUM PRESSURE CONDENSATE		NEEDLE VALVE		45° ELBOW		FLEXIBLE CONNECTOR		ELBOW WITH TURNING VANES		SQUARE RECTANGULAR CEILING RETURN GRILLE OR REGISTER		14' X 12'	DUCT SIZE TAG	
MPS	MEDIUM PRESSURE STEAM		PLUG VALVE		ELBOW, TURNED UP		STEAM TRAP, STEAM TRAP ASSEMBLY		DUCT FIRE (F) AND/OR SMOKE (S) DETECTORS		SQUARE RECTANGULAR CEILING EXHAUST GRILLE OR REGISTER		PIPE CENTERLINE ELEVATION TAG		E LEVEL 0
PC	PUMPED CONDENSATE		QUICK CLOSING, FUSIBLE LINK VALVE		ELBOW, TURNED DOWN		PUMP		BACK DRAFT DAMPER		LOUVERED DOOR		UNDERCUT DOOR		DUCT PRESSURE CLASSIFICATION (N) NEGATIVE OR (P) POSITIVE
RL	REFRIGERANT LIQUID		QUICK OPENING VALVE		VALVE IN RISER		FIN TUBE RADIATION		ELECTRIC OPERATED DAMPER		PNEUMATIC OPERATED DAMPER		EXISTING PIPE TO REMAIN		EXISTING PIPE DEMOLISHED
RS	REFRIGERANT SUCTION		SAFETY RELIEF VALVE		STRAINER		STRAINER WITH BLOWDOWN VALVE								
VAC	VACUUM														

NOTE: ALL SYMBOLS ARE NOT NECESSARILY APPLICABLE TO THIS PROJECT

### GENERAL NOTES

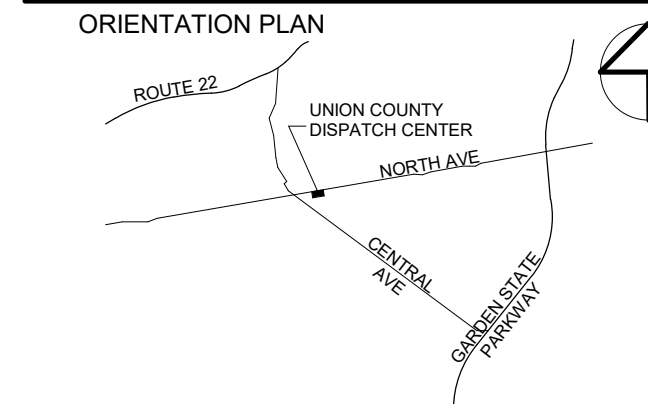
- ALL DIMENSIONS ARE IN ENGLISH UNITS UNLESS OTHERWISE NOTED.
- ALL DUCT DIMENSIONS ARE INSIDE CLEAR.
- VERIFY AND COORDINATE EQUIPMENT LAYOUT, SIZE, AND CONNECTING SERVICES WITH EQUIPMENT ACTUALLY SELECTED FOR INSTALLATION.
- DO NOT SCALE DUCTWORK AND EQUIPMENT SIZE.
- COORDINATE ENTIRE INSTALLATION OF THE HVAC SYSTEMS WITH THE WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION.
- COORDINATE EXACT LOCATION AND SIZES OF REQUIRED OPENINGS AND SUPPORTS FOR FURNISHED EQUIPMENT WITH THE GENERAL CONTRACTOR.
- ALL EQUIPMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S REQUIREMENTS.
- PROVIDE ALL FITTINGS, TRANSITIONS, DAMPERS, VALVES, AND OTHER DEVICES REQUIRED FOR COMPLETE WORKABLE INSTALLATION.
- ALL EQUIPMENT, DUCTS, PIPING, AND OTHER DEVICES OR MATERIAL EXPOSED TO THE WEATHER SHALL BE COMPLETELY WEATHERPROOF.
- ALL VALVES, CONTROLS, DAMPERS, FANS, ETC. SHALL BE INSTALLED IN ACCESSIBLE LOCATION. PROVIDE ADEQUATELY SIZED ACCESS DOOR OR PANELS WHERE REQUIRED.
- THE LOCATION OF CEILING AIR INLETS AND OUTLETS SHALL BE ACCORDANCE WITH ARCHITECTURAL REFLECTED CEILING PLAN.
- PROVIDE VALVED DRAINS AT LOW POINTS AND MANUAL AIR VENTS AT HIGH POINTS OF ALL HYDRONIC SYSTEMS.
- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
- CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
- POWER TO VAV BOXES AND MOTORIZED DAMPERS SHALL BE BY DIV. 23 CONTRACTOR.
- PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITH 50 FEET OF ISOLATED EQUIPMENT IN ACCESSIBLE LOCATIONS EXCEPT WHERE BASE ELBOW SUPPORTS AND ANCHOR POINTS) THROUGHOUT MECHANICAL EQUIPMENT ROOMS.
- LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP OR DOWNSTREAM AS RECOMMENDED BY MANUFACTURER FOR GOOD ACCURACY.
- ALL CONTROL WIRING SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND SPECIFICATIONS.
- CONCRETE HOUSEKEEPING PADS TO SUIT MECHANICAL EQUIPMENT SHALL BE SIZED BY A MECHANICAL CONTRACTOR.
- FOR TYPICAL DETAILS SEE SHEETS M-901.
- PROVIDE SUFFICIENT CLEARANCE FOR AHUS, AND AC'S COLL/PULL AND IN FRONT OF ACCESS DOORS/PANELS/FILTER.
- 120 VOLT POWER FROM ELECTRICAL PANELS TO DDC CONTROLLERS, ALARM PANELS AND OTHER DDC EQUIPMENT SHALL BE BY DIV. 23 CONTRACTOR.
- DUCTWORK LAYOUT IS DIAGRAMMATIC ONLY. IN THE PROCESS TO COORDINATE THE DUCT INSTALLATION WITH OTHER TRADES, THE CONTRACTOR MAY REARRANGE THE DUCTWORK DOWNSTREAM OF TERMINAL UNIT FOR AN OPTIMAL LAYOUT. THE FOLLOWING RULES SHALL BE FOLLOWED:
  - MAXIMUM OF 5 FT OF FLEXIBLE DUCT SHALL BE USED.
  - DUCT SIZE FOR THE TOTAL FLOW THROUGH THE BRANCH SHALL BE AS FOLLOWS:
 

0 - 40	CFM 4-INCH	425 - 660	CFM 12-INCH
45 - 70	CFM 5-INCH	665 - 1000	CFM 14-INCH
75 - 110	CFM 6-INCH	1005 - 1500	CFM 16-INCH
115 - 230	CFM 8-INCH	1550 - 2000	CFM 18-INCH
235 - 420	CFM 10-INCH	2000 - 2600	CFM 20-INCH

ISS / REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV 1

CLIENT

CONSULTANT



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**Kyle W. Berninger**  
 Professional Engineer - New Jersey  
 License no. 55318

SIGNATURE DATE

CLIENT  
**Union County Div of Engineering**

PROJECT  
**UNION COUNTY DISPATCH CENTER AREA EXPANSION**  
 FROELICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME  
**HVAC - LEAD SHEET**

JOB NO.: 030090002  
 DATE: 08/31/2020  
 DRAWN: MD  
 CHECK: KWB  
 SCALE: 12" = 1'-0"  
 SHEET NO.

**M-001**

#### ABBREVIATIONS HVAC

SYMBOL	DESCRIPTION
MEPF	MECHANICAL EQUIPMENT FILTER
MBH	1000 BTUH
AFF	ABOVE FINISHED FLOOR
AD	ACCESS DOOR
AC	AIR CONDITIONING, ALTERNATING CURRENT
AF	AIR FILTER
AHU	AIR HANDLING UNIT
APD	AIR PRESSURE DROP
AS	AIR SEPARATOR
AMD	AIRFLOW MEASURING DEVICE
AMB	AMBIENT
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS, INC.
AWG	AMERICAN WIRE GAGE
AMP	AMPERE
APPROX	APPROXIMATE
ATM	ATMOSPHERE
AAV	AUTOMATIC AIR VENT
ACD	AUTOMATIC CONTROL DAMPER
AVG	AVERAGE
BDD	BACKDRAFT DAMPER
BB	BASEBOARD RADIATION
B	BOILER
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BHP	BRAKE HORSEPOWER
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BLDG	BUILDING
BAS	BUILDING AUTOMATION SYSTEM
BMS	BUILDING MANAGEMENT SYSTEM
CUH	CABINET UNIT HEATER
CAP	CAPACITY
CLG	CEILING
CPU	CENTRAL PROCESSING UNIT
CHK	CHECK
CHGR	CHILLED GLYCOL RETURN
CHGS	CHILLED GLYCOL SUPPLY
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CH	CHILLER
CRK	CIRCUIT
CW	CITY WATER, COLD WATER, CLOCKWISE
CV	COEFFICIENT, VALVE FLOW
COL	COLUMN
CA	COMPRESSED AIR
CMPR	COMPRESSOR
COND	CONDENS (ER, -ING, -ATION)
CRU	CONDENSATE RETURN UNIT
CWP	CONDENSER WATER PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CU	CONDENSOR, CONDENSING UNIT
CAV	CONSTANT AIR VOLUME TERMINAL
CC	COOLING COIL
CLG LOAD	COOLING LOAD
CCW	COUNTERCLOCKWISE
CU FT	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CFM SQ FT	CUBIC FEET PER MINUTE PER SQUARE FOOT
CU IN	CUBIC INCH
DB	DECEMBER, DRY BULB
DEG	DEGREES
DEG	DEGREES CELSIUS
DEG	DEGREES FAHRENHEIT
DEH	DEHUMIDIFIER
D	DEPTH, DRAIN
DPT	DEW-POINT TEMPERATURE
Ø DIA, DIM	DIAMETER
DI	DIAMETER, INSIDE
DO	DIAMETER, OUTSIDE
DIFF	DIFFERENTIAL

#### ABBREVIATIONS HVAC

SYMBOL	DESCRIPTION
DDCP	DIRECT DIGITAL CONTROL PANEL
DX	DIRECT EXPANSION
DN	DOWN (PENETRATES FLOOR SLAB)
DWG	DRAWING
EA	EACH EXHAUST AIR
%EFF	EFFICIENCY, PERCENTAGE
EL	ELEVATION
ENT	ENTERING
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB
EWI	ENTERING WATER TEMPERATURE
EWB	ENTERING WET BULB
EXH	EXHAUST
EF	EXHAUST FAN
EG	EXHAUST GRILLE
ER	EXHAUST REGISTER
EXP	EXPANSION
ET	EXPANSION TANK
ESP	EXTERNAL STATIC PRESSURE
FA	FACE AREA, FIRE ALARM
FLP	FAIL AT LAST POSITION
FC	FAIL CLOSED
FO	FAIL OPEN
FPS	FAN POWER BOX
FT HD	FEET HEAD
PPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
FPT	FEMALE PIPE THREAD
FT	FIN TUBE RADIATION
FPI	FINS PER INCH
FD	FIRE DAMPER, FLOOR DRAIN
FC	FLEXIBLE CONNECTION
FT LB	FOOT-POUND
FZ	FREEZE STAT
CAP	CAPACITY
FLA	FULL LOAD AMP
GA	GAGE, GALLON
GAL	GALLONS
GPM	GALLONS PER MINUTE
GC	GENERAL CONTRACTOR
GR	GRAINS
GLB	GRAINS PER POUND
HD	HEAD, HEAT DETECTOR
HX	HEAT EXCHANGER
HC	HEATING COIL
HGSR	HEATING HOT GLYCOL RETURN
HHGS	HEATING HOT GLYCOL SUPPLY
HHWP	HEATING HOT WATER PUMP
HHWR	HEATING HOT WATER RETURN
HHWS	HEATING HOT WATER SUPPLY
HWAC	HEATING, VENTILATION AND AIR CONDITIONING
H, HT	HEIGHT
HZ	HERTZ (FREQUENCY)
HEPA	HIGH EFFICIENCY PARTICULATE AIR
HPC	HIGH PRESSURE CONDENSATE
HPS	HIGH PRESSURE STEAM
HP	HORSEPOWER, HEAT PUMP
HR	HOURS(S)
H	HUMIDIFIER
H, CLNG	HUNG CEILING
IN	INCHES
IN WC	INCHES WATER COLUMN
IN WG	INCHES WATER GAUGE
IFB	INTEGRAL FACE AND BYPASS
IDS	INTEGRATED DEHUMIDIFICATION SYSTEM
ISP	INTERNAL STATIC PRESSURE
IPS	IRON PIPE SIZE
KW	KILOWATT
KWH	KILOWATT HOUR
LD	LEAK DETECTOR, LINEAR DIFFUSER
LVG	LEAVING
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB
LWT	LEAVING WATER TEMPERATURE
LWB	LEAVING WET BULB

#### ABBREVIATIONS HVAC

SYMBOL	DESCRIPTION
L LG	LENGTH
LF	LINEAR FEET
LQ	LIQUID
LV	LOUVER
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
MAU	MAKE-UP AIR UNIT
MPF	MALE PIPE THREAD
MAV	MANUAL AIR VENT
MFR	MANUFACTURER
MAX	MAXIMUM
MER	MECHANICAL EQUIPMENT ROOM
MPC	MEDIUM PRESSURE CONDENSATE
MPS	MEDIUM PRESSURE STEAM
HG	MERCURY
MPS	MALES PER HOUR
MIN	MINIMUM
MHP	MOTOR HORSEPOWER
NEMA	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NPS	NATIONAL PIPE STANDARD
NPT	NATIONAL PIPE THREAD
NOM	NORMAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OCCUP	OCCUPANCY
OSHA	OCCUPATIONAL SAFETY & HEALTH ACT/AGENCY
OED	OPEN ENDED DUCT
OZ	OUNCE
OA	OUTSIDE AIR
OS&Y	OUTSIDE SCREW & YOKE GATE VALVE
PPM	PARTS PER MILLION
PL	PHASE (ELECTRICAL)
PA	PIPE ANCHOR
PG	PIPE GUIDE
PS	PIPE SUPPORT
PVC	POLYVINYL CHLORIDE
LB	POUND
LBS/HR	POUNDS PER HOUR
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PHC	PREHEAT COIL
P, PRESS	PRESSURE
P, PD	PRESSURE DROP, DIFFERENTIAL PRESSURE
PC	PUMPED CONDENSATE
QTY.	QUANTITY
RCR	RECEIVER
R12, R22	REFRIGERANT (12, 22, ETC.)
RG	REFRIGERANT HOT GAS
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RHC	REHEAT COIL
RH	RELATIVE HUMIDITY
RAD	RELIEF AIR DAMPER
REQD	REQUIRED
RA	RETURN AIR
RF	RETURN FAN
RG	RETURN GRILLE
RR	RETURN REGISTER
RPM	REVOLUTIONS PER MINUTE
RD	ROOF DRAIN
RTU	ROOF TOP UNIT
RM	ROOM
SF	SAFETY FACTOR, SUPPLY FAN
SCH	SCHEDULE
S	SECOND
SM	SHEET METAL
SPEC	SPECIFICATION
SQ	SQUARE
SG FT	SQUARE FEET
SQ IN	SQUARE INCHES
SS	STAINLESS STEEL

#### ABBREVIATIONS HVAC

SYMBOL	DESCRIPTION
STD	STANDARD
SP	STATIC PRESSURE
SA	SUPPLY AIR, SOUND ATTENUATOR
SD	SUPPLY DIFFUSER, SMOKE DETECTOR
SG	SUPPLY GRILLE
SR	SUPPLY REGISTER
T, TEMP	TEMPERATURE
TE	TEMPERATURE, ENTERING
TL	TEMPERATURE, LEAVING
PT	TEST PLUG
TC	THERMOCOUPLE
T STAT	THERMOSTAT
UV	ULTRAVIOLET
UL	UNDERWRITER'S LABORATORY
UH	UNIT HEATER
UNON	UNLESS OTHERWISE NOTED
UP	UP (PENETRATES FLOOR SLAB)
V	VALVE, VENT, VOLTS
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
VEL	VELOCITY
VOL	VOLT AMPERE
VOL	VOLUME
VD	VOLUME DAMPER
WC	WATER COLUMN, WATER CLOSET
WG	WATER GAUGE
WH	WATER HEATER, WATT-HOUR
W	WATT, WIDTH, WASTE
WT	WEIGHT, WATER TREATMENT
WB	WET BULB



























**ELECTRICAL SYMBOLS LEGEND**

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	EXISTING UNDERGROUND ELECTRIC CONDUIT		EMERGENCY SHUNT RELAY LOW VOLTAGE GR2001 EMSHUNT 120 DUAL NE1 OR APPROVED EQUAL
	UNDERGROUND ELECTRIC CONDUIT		LIGHTING CONTROL PANEL NIGHT & PORTAL BRIDGE (NBRG 8 KIT BY ACQUITY BRANDS OR APPROVED EQUAL)
	UNDERGROUND MOUNTING CONDUCTOR		DUAL TECHNOLOGY CEILING MOUNTED OCCUPANCY SENSOR
	ELECTRICAL EQUIPMENT TAG		DIMMABLE DAYLIGHT PHOTOSENSOR - CEILING MOUNTED
	CIRCUIT HOMERUN (I.E., TO PANEL '1E-LRP-#', CIRCUIT #)		CONTROL PANEL
	CONCEALED CONDUIT IN WALL OR ABOVE CEILING		LIGHTING RELAY ROOM CONTROLLER - MOUNTED ABOVE CEILING
	CONCEALED WIRING IN OR BELOW FLOOR		FIRE ALARM VISUAL DEVICE
	CONDUIT TURNED UP		FIRE ALARM AUDIBLE/VISUAL DEVICE
	CONDUIT TURNED DOWN		FIRE ALARM FLOW SWITCH
	JUNCTION BOX - WALL MOUNTED		FIRE ALARM TAMPER SWITCH
	JUNCTION BOX - MOUNTED ABOVE CEILING		FIRE ALARM MONITORING MODULE
	PANELBOARD - SURFACE MOUNTED		FIRE ALARM REMOTE INDICATOR LIGHT - WALL MOUNTED
	PANELBOARD - FLUSH MOUNTED		FIRE ALARM REMOTE INDICATOR LIGHT - CEILING MOUNTED
	GROUND ROD		DIRECT DIGITAL CONTROL UNIT (BY MECHANICAL CONTRACTOR)
	GROUND TEST WELL		FIRE ALARM NOTIFICATION ALARM PANEL
	SAFETY DISCONNECT SWITCH, NUMBER INDICATES SIZE, TYPE, AND RATING (AMP RATING / POLES / FUSE SIZE)		FIRE ALARM ISOLATION MODULE
	MOTOR - NUMBER INDICATES HORSEPOWER		FIRE ALARM HEAT DETECTOR - CEILING MOUNTED
	DUPLEX RECEPTACLE (I.E., POWERED FROM PANEL RP1, CIRCUIT 2) - CIRCUIT NOMENCLATURE APPLIES TO ALL WIRING DEVICES		FIRE ALARM SMOKE DETECTOR - CEILING MOUNTED
	DUPLEX RECEPTACLE OUTLET WITH IN-USE BOX HOOD COVER - WEATHERPROOF		FIRE ALARM DUCT SMOKE DETECTOR, SUBSCRIPT REPRESENTS: RA - RETURN AIR, SA - SUPPLY AIR
	DOUBLE DUPLEX RECEPTACLE		FIRE ALARM COMBINATION SMOKE/CARBON MONOXIDE DETECTOR WITH SOUNDER BASE - CEILING MOUNTED
	SINGLE RECEPTACLE		FIRE ALARM CONTROL MODULE
	DUPLEX RECEPTACLE - MOUNTED ABOVE COUNTER		FIRE ALARM END OF LINE DEVICE
	DUPLEX RECEPTACLE OUTLET WITH GROUND FAULT PROTECTION		FIRE ALARM MANUAL PULL STATION
	SINGLE 50A, 150/250V, 3 POLE, 3 WIRE (NEMA 10-30R RECEPTACLE)		FIRE ALARM ANNUNCIATOR PANEL
	POWER AND DATA WALL BOX FOR TV DISPLAY		FIRE ALARM CONTROL PANEL
	WALKER DUCT PRO SERIES WREMOLD FOR POWER AND DATA		DOUBLE DUPLEX DATA JACK - WALL MOUNTED
	8' WRAP AROUND LED FIXTURE		QUAD DATA JACK - WALL MOUNTED
	4' SURFACE MOUNTED LINEAR LED FIXTURE		CEILING MOUNTED COLOR CAMERA IN DOME TYPE VANDAL PROOF ENCLOSURE, SUBSCRIPT INDICATES PTZ = PAN TILT ZOOM; FC = DOME FIXED CAMERA; W = WIDE ANGLE LENSE
	4' APERTURE RECESSED LINEAR LED FIXTURE		DASHED LINE INDICATES CAMERA VIEWING AREA
	2' x 2' HOURGLASS STYLE LED FIXTURE		WIRELESS ACCESS POINT
	4' SEALED RECESSED DOWNLIGHT LED FIXTURE		EMERGENCY SHUNT RELAY - NUMBER INDICATES CIRCUIT (EM# = EMERGENCY AND N# = NORMAL CIRCUIT)
	EMERGENCY LIGHT FIXTURE WITH TYPE MARK (TYPE F1A), SWITCH ID (A), AND CIRCUIT NUMBER (1)		SECURITY DOOR CONTACTS
	LIGHT FIXTURE WITH TYPE MARK (TYPE F1), SWITCH ID (A), AND CIRCUIT NUMBER (1)		SECURITY KEY FOB
	UNIVERSAL MOUNTED EXIT LIGHT - ARROWS INDICATE EGRESS DIRECTION, SHADING INDICATES FACE		MAGNETIC DOOR LOCK
	TRANSIENT VOLTAGE SURGE SUPPRESSOR, SUBSCRIPT INDICATES TYPE: A - SERVICE ENTRANCE SUPPRESSOR B - PANEL SUPPRESSOR C - BRANCH CIRCUIT SUPPRESSOR		CARD READER
	DIRECT DIGITAL CONTROL UNIT (PROVIDED BY MECHANICAL CONTRACTOR)		FLUSH FLOOR MOUNTED DUAL POWER AND DATA FLOOR BOX WALKER DUCT OR APPROVED EQUAL
	PHOTO CONTROL DEVICE		WALL BOX POWER AND DATA FOR TV DISPLAYS
	REMOTE CONTACTOR - SUBSCRIPT INDICATES TYPE		VENDOR SUPPLIED EQUIPMENT
	LOW VOLTAGE DIMMING SWITCH NP0DM DX WH OR APPROVED EQUAL		EXISTING EQUIPMENT TO BE REMOVED
	THREE WAY SWITCH - WALL MOUNTED		EXISTING EQUIPMENT TO REMAIN
	MOTOR RATED SWITCH WITH THERMAL OVERLOADS		RELOCATED EXISTING EQUIPMENT
	LOW VOLTAGE TOUCHSCREEN WALLPOD NP0D TOUCH WH (ACQUITY BRANDS OR APPROVED EQUAL)		REMOVE AND RELOCATE EQUIPMENT
	TWO(2) BUTTON DIGITAL SWITCH - WALL MOUNTED		
	ONE(1) BUTTON PASSIVE INFRARED, VACANCY SENSOR SWITCH - WALL MOUNTED WSX PDT SA WH OR APPROVED EQUAL		
	TWO(2) BUTTON DIMMING SWITCH VACANCY SENSOR - WALL MOUNTED WSX PDT SA WH OR APPROVED EQUAL		
	CEILING MOUNTED OCCUPANCY SENSOR		
	EMERGENCY POWER RELAY PACK NPP16D ER EFP OR APPROVED EQUAL, SUBSCRIPT INDICATES ZONES		
	POWER RELAY PACK NPP16 D EFP OR APPROVED EQUAL, SUBSCRIPT INDICATES ZONES		

NOTE: NOT ALL SYMBOLS SHOWN IN LEGEND MAY BE USED.

**ABBREVIATIONS ELECTRICAL**

SYMBOL	DESCRIPTION
MEFP	MECHANICAL EQUIPMENT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AMU	AIR HANDLING UNIT
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AWG	AMERICAN WIRE GAGE
AMP	AMPERE
ALSG	ARC LONG, SHORT, INSTANTANEOUS, GROUND
AVG	AVERAGE
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BAS	BUILDING AUTOMATION SYSTEM
BMS	BUILDING MANAGEMENT SYSTEM
CLG	CEILING
CHK	CHECK
CKT	CIRCUIT
' DEG	DEGREES
' F	DEGREES FAHRENHEIT
D	DEPTH, DRAIN
Ø, DIA, DIM	DIAMETER
ID	DIAMETER, INSIDE
OD	DIAMETER, OUTSIDE
DN	DOWN (PENETRATES FLOOR SLAB)
DWG	DRAWING
%EFF	EFFICIENCY, PERCENTAGE
EWC	ELECTRIC WATER COOLER
EL	ELEVATION
EF	EXHAUST FAN
FA	FACE AREA, FIRE ALARM
FM	FACTORY MUTUAL
' FT	FEET, FOOT
FACP	FIRE ALARM CONTROL PANEL
FCV	FLOOR CONTROL VALVE ASSEMBLY
FLA	FULL LOAD AMP
GA	GAGE, GAUGE
GC	GENERAL CONTRACTOR
HD	HEAD, HEAT DETECTOR
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
H, HT	HEIGHT
HZ	HERTZ (FREQUENCY)
HP	HORSEPOWER, HEAT PUMP
H, CLNG	HUNG CEILING
' IN	INCHES
L, LG	LENGTH
LF	LINEAR FEET
MFR	MANUFACTURER
MNS	MASS NOTIFICATION SYSTEM
MAX	MAXIMUM
MER	MECHANICAL EQUIPMENT ROOM
MIN	MINIMUM
MHP	MOTOR HORSEPOWER
NEMA	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NOM	NOMINAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OCCUP	OCCUPANCY
OSHA	OCCUPATIONAL SAFETY & HEALTH AGENCY
PH	PHASE (ELECTRICAL)
LBS	POUND
REQ'D	REQUIRED
RPM	REVOLUTIONS PER MINUTE
RM	ROOM
SF	SAFETY FACTOR, SUPPLY FAN
SCH	SCHEDULE
S	SECOND
SPEC	SPECIFICATION
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
TS	TAMPER SWITCH
T, TEMP	TEMPERATURE
TYP	TYPICAL
UL	UNDERWRITER'S LABORATORY
UON	UNLESS OTHERWISE NOTED
UP	UP (PENETRATES FLOOR SLAB)
V	VALVE, VENT, VOLTS
WFS	WATER FLOW SWITCH
W	WATT, WIDTH, WASTE
WT	WEIGHT, WATER TREATMENT
Z	ZONE

**GENERAL NOTES**

- PROVIDE ALL MATERIALS, LABOR, EQUIPMENT AND SERVICES AND PERFORM ALL OPERATIONS IN CONNECTION WITH THE ELECTRICAL WORK. IT IS THE INTENT THAT THESE DRAWINGS PROVIDE THE WORK REQUIRED FOR AN ELECTRICAL INSTALLATION THAT IS COMPLETE IN EVERY RESPECT, READY FOR OPERATION.
- THE DRAWINGS, DIVISION 0-BIDDING & CONTRACT FORMS, AND DIVISION 1, GENERAL REQUIREMENTS GOVERN THIS WORK. WHERE ITEMS OF GENERAL CONDITIONS AND REPEATED HEREIN, IT IS INTENDED TO QUALIFY OR TO CALL PARTICULAR ATTENTION TO THEM. IT IS NOT INTENDED THAT ANY OTHER PARTS OF THE GENERAL CONDITIONS SHALL BE ASSUMED TO BE OMITTED.
- ALL WORK SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL CODES AND THE REQUIREMENTS OF ANY OTHER AUTHORITIES HAVING JURISDICTION. ALL MATERIAL AND EQUIPMENT SHALL BE LISTED AND SHALL BEAR THE UL INSPECTION LABEL, WHEREVER STANDARDS HAVE BEEN ESTABLISHED. AT THE COMPLETION OF THE WORK, SECURE CERTIFICATES OF APPROVAL FROM THE VARIOUS AUTHORITIES HAVING JURISDICTION AND DELIVER SAME TO PAULIUS, SOKOLOWSKI AND SARTOR ("THE DESIGN PROFESSIONAL").
- ALL WORK SHALL COMPLY WITH NECA STANDARD OF INSTALLATION (PUBLISHED BY THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION) AND NFPA 70 - NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE STANDARDS THE OWNER HAS DEVELOPED AS THEY PERTAIN TO THIS WORK.
- "PROVIDE" MEANS TO SUPPLY, ERECT, INSTALL AND CONNECT UP IN COMPLETE READINESS FOR REGULAR OPERATION. THE PARTICULAR WORK REFERRED TO "FURNISH" MEANS TO SUPPLY AND DELIVER TO THE JOB. "INSTALL" MEANS TO RECEIVE, INSTALL AND CONNECT UP IN COMPLETE READINESS FOR REGULAR OPERATION. THE PARTICULAR WORK REFERRED TO "APPROVED EQUAL" MEANS ANY EQUIPMENT, THE PARTICULAR WORK REFERRED TO "APPROVED EQUAL" MEANS ANY EQUIPMENT OR MATERIAL WHICH IN THE OPINION OF THE DESIGN PROFESSIONALS, IS EQUAL IN QUALITY, DURABILITY, APPEARANCE, STRENGTH, DESIGN, PERFORMANCE, PHYSICAL DIMENSIONS, AND ARRANGEMENT TO THE EQUIPMENT OR MATERIAL SPECIFIED AND WILL FUNCTION ADEQUATELY IN ACCORDANCE WITH THE GENERAL DESIGN.
- BEFORE SUBMITTING THE BID, VISIT EACH SITE WHERE WORK IS REQUIRED, SURVEY THE EXISTING CONDITIONS AND BECOME FAMILIAR WITH THE DIFFICULTIES WHICH WILL AFFECT THE EXECUTION AND COMPLETION OF THE WORK. INVESTIGATE THE NATURE AND LOCATION OF THE WORK, THE GENERAL AND LOCAL CONDITIONS, PARTICULARLY THOSE BEARING UPON THE WORK REQUIRED, TRANSPORTATION, DISPOSAL, HANDLING AND STORAGE OF MATERIALS, AVAILABILITY OF LABOR, WATER, ELECTRIC POWER, ROADS, AND PHYSICAL CONDITIONS AT THE SITE NEEDED FOR THE PROSECUTION OF THE WORK AND ALL OTHER MATTERS UPON WHICH INFORMATION IS REASONABLY OBTAINABLE AND WHICH CAN IN ANY WAY AFFECT THE WORK OR THE COST THEREOF UNDER THE CONTRACT.
- PROCURE AND PAY FOR ALL CERTIFICATES, FEES, TESTS, INSPECTIONS, BONDS, DEPOSITS, AND ESCROW ACCOUNTS, REQUIRED FOR COMPLETE INSTALLATION OF THE WORK. SECURE AND PAY FOR ALL NECESSARY PERMITS FROM THE CITY, TOWN, COUNTY, AND OTHER AUTHORITIES. GIVE ALL NOTICES REQUIRED BY LAW, ORDINANCES, OR THE RULES AND REGULATIONS OF THE VARIOUS AUTHORITIES. COMPLY WITH ALL ORDERS OF THE LOCAL DEPARTMENT OF BUILDINGS, COUNTY DEPARTMENT OF HEALTH, FIRE MARSHAL, ETC. DELIVER TO THE OWNER'S REPRESENTATIVE ALL PERMITS AND CERTIFICATES OF APPROVAL ISSUED BY ALL TOWN, COUNTY, AND STATE AGENCIES HAVING JURISDICTION IN CONNECTION WITH THIS WORK, BEFORE THE CERTIFICATE FOR THE FINAL PAYMENT IS ISSUED.
- NO WORK SHALL BE COVERED OVER UNTIL TESTS HAVE BEEN PERFORMED AND THE AUTHORITIES HAVING JURISDICTION HAVE EXAMINED, INSPECTED AND APPROVED THE TESTS AND THE WORK. PROVIDE ALL CONTROLLED INSPECTIONS REQUIRED BY THE REGULATIONS OF TOWN, COUNTY, AND STATE. THE CONTROLLED INSPECTIONS SHALL BE MADE BY AN INSPECTOR MEETING THE PROFESSIONAL REQUIREMENTS SET FORTH BY STATE AND LOCAL LAWS AND SHALL BE CARRIED OUT IN ACCORDANCE WITH APPLICABLE TOWN, COUNTY, AND STATE BUILDING CODES.
- TAKE OUT ALL NECESSARY INSURANCE, FREE OF EXTRA CHARGE, AND AGREE TO INDEMNIFY AND SAVE HARMLESS THE PARTY CONTRACTING FOR SERVICES, AGAINST LOSS OR EXPENSE.
- THE DRAWINGS DO NOT UNDERTAKE TO ILLUSTRATE OR SET FORTH EVERY ITEM NECESSARY FOR THE WORK AS IT IS ASSUMED THAT WITH HIS BID SUBMISSION, THE CONTRACTOR ACKNOWLEDGES THAT HE IS EXPERT IN THE SEVERAL LINES OF THE WORK AND IS CAPABLE OF INTERPRETING THEM. WHERE NO SPECIFIED MANUFACTURER OR QUALITY OF MATERIAL IS GIVEN, A FIRST-CLASS STANDARD ARTICLE AS APPROVED BY THE DESIGN PROFESSIONAL SHALL BE FURNISHED.
- THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ARE INTENDED TO CONVEY THE SCOPE OF WORK AND INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, CONDUITS, PANELS, FIXTURES, ETC. THE LOCATIONS OF ALL ITEMS SHOWN THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED AT THE PROJECT AND SHALL HAVE THE APPROVAL OF THE DESIGN PROFESSIONAL BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
- MANTAIN AND PROTECT ALL EQUIPMENT, MATERIALS AND TOOLS FROM LOSS OR DAMAGE FROM ALL CAUSES UNTIL FINAL ACCEPTANCE BY THE OWNER.
- IT IS REQUIRED THAT THE WORK INDICATED BE CARRIED OUT WITH A MINIMUM OF INTERFERENCE TO THE ESTABLISHED ROUTINE OF THE EXISTING BUILDINGS, AND THAT ALL WORK BE PERFORMED WITHIN THE REQUIRED CONTRACT TIME. ANY WORK NECESSARY TO BE PERFORMED AFTER REGULAR WORKING HOURS, SHALL BE PERFORMED WITHOUT ADDITIONAL EXPENSE TO THE OWNER.
- THE OWNER'S REPRESENTATIVE SHALL BE NOTIFIED, IN WRITING, WHEN INTERRUPTION OF THE PRESENTLY MAINTAINED SERVICES, MECHANICAL, ELECTRICAL OR OTHERWISE IS REQUIRED. WRITTEN PERMISSION SHALL BE OBTAINED FROM THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING WITH THE SHUT-DOWN.
- PROVIDE ALL NECESSARY TRAILERS, EXTENSION CORDS AND LAMPS, TO PROVIDE TEMPORARY LIGHT AND POWER FOR THE PROPER EXECUTION OF ALL WORK.
- PROVIDE ALL SCAFFOLDING, RIGGING, HOISTING, AND SERVICES NECESSARY FOR ERECTION AND DELIVERY INTO THE PREMISES OF ANY EQUIPMENT AND APPARATUS FURNISHED. REMOVE SAME FROM PREMISES WHEN NO LONGER REQUIRED.
- ALL WORK SHOWN ON THE DRAWINGS THAT IS NOT SPECIFICALLY INDICATED AS BEING EXISTING SHALL BE ASSUMED TO BE NEW.
- THE INSTALLATION OF ALL ELECTRICAL EQUIPMENT, LIGHTING, CONDUIT AND WIRING SHALL CONFORM TO THE LATEST EDITION IBC CODE EARTHQUAKE CONTROL SECTION 1622.

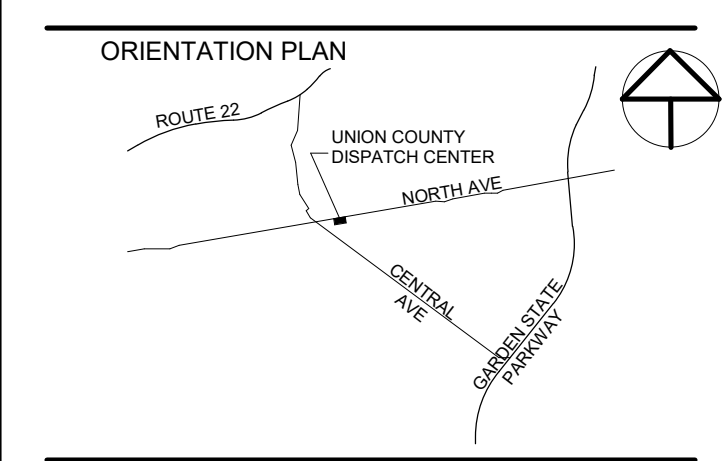
**DRAWING LIST - ELECTRICAL**

SHEET NUMBER	SHEET NAME
E-001	ELECTRICAL - LEAD SHEET
E-002	ELECTRICAL - SITE PLAN
E-051	ELECTRICAL - LIGHTING DEMOLITION PLANS - PHASE 1
E-052	ELECTRICAL - LIGHTING DEMOLITION PLAN - PHASE 2
E-053	ELECTRICAL - LIGHTING AND POWER PLAN DEMOLITION
E-054	ELECTRICAL - POWER DEMOLITION PLAN - PHASE 1
E-055	ELECTRICAL - POWER DEMOLITION PLAN - PHASE 2
E-056	ELECTRICAL - SIGNALS DEMOLITION PLAN - PHASE 1
E-057	ELECTRICAL - SIGNALS DEMOLITION PLAN - PHASE 2
E-101	ELECTRICAL - LIGHTING PLANS - PHASE 1
E-102	ELECTRICAL - LIGHTING PLANS - PHASE 2
E-103	ELECTRICAL - LIGHTING & POWER PLAN
E-201	ELECTRICAL - POWER PLANS - PHASE 1
E-202	ELECTRICAL - POWER PLANS - PHASE 2
E-301	ELECTRICAL - SIGNALS PLAN - PHASE 1
E-302	ELECTRICAL - SIGNALS PLAN - PHASE 2
E-501	ELECTRICAL - PART PLANS
E-701	ELECTRICAL - SCHEDULES (SHEET 1 OF 3)
E-702	ELECTRICAL - SCHEDULES (SHEET 2 OF 3)
E-703	ELECTRICAL - SCHEDULES (SHEET 3 OF 3)
E-801	ELECTRICAL RISER DIAGRAM DEMO
E-802	ELECTRICAL ON-LINE NEW WORK
E-803	ELECTRICAL LIGHTING CONTROL S DIAGRAMS
E-901	ELECTRICAL - DETAILS (SHEET 1 OF 2)
E-902	ELECTRICAL - DETAILS (SHEET 2 OF 2)

ISS / REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV 1

CLIENT

CONSULTANT



PAULIUS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
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 ALL DIMENSIONS SHALL BE AS NOTED & INDICATED ON THE CONTRACT DRAWINGS. DO NOT SCALE THE CONTRACT DRAWINGS OR SPECIFICATIONS.  
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**Fred F. Chen**  
 Professional Engineer - New Jersey  
 License no. 52950

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT  
**Union County Div of Engineering**

PROJECT  
**UNION COUNTY DISPATCH CENTER AREA EXPANSION**  
 FROELICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME  
**ELECTRICAL - LEAD SHEET**

JOB NO.: 030090002  
 DATE: 08/31/2020  
 DRAWN: SEO  
 CHECK: RKS  
 SCALE: 12" = 1'-0"  
 SHEET NO.

**E-001**

























































EXISTING Panelboard: 1B-SEC1													
Panel	Voltage			Phase			Wires			Mains Rating			Main Type
1B-SEC1	120/208 Wye			3			4			400 A			MLO
Mounting	Enclosure			Location			Supply From			MCB Rating			A.I.C. Rating
SURFACE	TYPE 1			EX. ELEC 103						225 A			14,000
Circuit Description	Wire Size	Trip	Poles	CKT	A	B	C	CKT	Poles	Trip	Wire Size	Circuit Description	
LIGHTING	1-#12, 1-#12, 1-#12	20 A	1	1	0 VA / 0 VA	0 VA / 0 VA		2	1	20 A	--	EXISTING LOAD	
ROOM 167, 002, 003	1-#12, 1-#12, 1-#12	20 A	1	3		0 VA / 0 VA		4	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	5			0 VA / 0 VA	6	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	7	0 VA / 0 VA			8	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	9		0 VA / 0 VA		10	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	11			0 VA / 0 VA	12	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	13	0 VA / 500 VA			14	1	20 A	1-#12, 1-#12, 1-#12	EX. WOMEN 114	
EXISTING LOAD	--	20 A	1	15		0 VA / 0 VA		16	2	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	17			0 VA / 0 VA	18	2	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	19	0 VA / 0 VA			20			--	SPARE	
EXISTING LOAD	--	20 A	1	21		0 VA / 0 VA		22	3	35 A	--	SPARE	
EXISTING LOAD	--	20 A	1	23			0 VA / 0 VA	24			--	EXISTING SPARE	
EXISTING LOAD	--	20 A	1	25	0 VA / 0 VA			26	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	2	27		0 VA / 0 VA		28	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	2	29			0 VA / 0 VA	30	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	31	0 VA / 0 VA			32	1	20 A	--	EXISTING LOAD	
SPARE	--	20 A	2	33		0 VA / 540 VA		34	1	20 A	1-#12, 1-#12, 1-#12	DISPATCH 001	
Room 167, 003, 002	1-#12, 1-#12, 1-#12	20 A	1	37	900 VA / 0 VA			38	1	20 A	--	SPARE	
BREAK ROOM 002	1-#12, 1-#12, 1-#12	20 A	1	39		380 VA / 0 VA		40	1	20 A	--	EXISTING LOAD	
BUSSED SPACE	--	--	--	41			0 VA / 0 VA	42	1	20 A	--	EXISTING LOAD	
<b>Total Load:</b>					1400 VA	900 VA	900 VA						
<b>Total Amps:</b>					13 A	9 A	9 A						
<b>Lighting Connected Load</b>					<b>Power Connected Load</b>			<b>Total Connected KVA</b>					
0 VA					2300 VA			2300 VA					
<b>Lighting Estimated Demand</b>					<b>Power Estimated Demand</b>			<b>Total Estimated Demand</b>					
0 VA					2300 VA			2300 VA					

Notes:  
1. CONTRACTOR TO UTILIZE EXISTING CIRCUIT BREAKERS FOR NEW WORK.  
2. PROVIDE 20A, 1 POLE CIRCUIT BREAKER FOR NEW CIRCUITS. CIRCUIT BREAKER TO MATCH EXISTING TYPE.

EXISTING Panelboard: ERPE													
Panel	Voltage			Phase			Wires			Mains Rating			Main Type
ERPE	120/208 Wye			3			4			125 A			MLO
Mounting	Enclosure			Location			Supply From			MCB Rating			A.I.C. Rating
SURFACE	TYPE 1						ERPE			225 A			
Circuit Description	Wire Size	Trip	Poles	CKT	A	B	C	CKT	Poles	Trip	Wire Size	Circuit Description	
EXISTING SPARE	--	20 A	1	1	0 VA / 0 VA			2	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	3		0 VA / 0 VA		4	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	5			0 VA / 0 VA	6	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	7	0 VA / 0 VA			8	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	9		0 VA / 0 VA		10	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	11			0 VA / 0 VA	12	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	13	0 VA / 0 VA			14	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	15		0 VA / 0 VA		16	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	17			0 VA / 0 VA	18	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	19	0 VA / 0 VA			20	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	21		0 VA / 0 VA		22	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	23			0 VA / 0 VA	24	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	25	0 VA / 0 VA			26	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	27		4581 VA / 0 VA		28	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	29			5103 VA / 0 VA	30	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	31	5103 VA / 0 VA			32	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	33		0 VA / 0 VA		34	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	35			0 VA / 0 VA	36	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	37	0 VA / 0 VA			38	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	39		0 VA / 0 VA		40	1	20 A	--	EXISTING SPARE	
EXISTING SPARE	--	20 A	1	41			0 VA / 0 VA	42	1	20 A	--	EXISTING SPARE	
<b>Total Load:</b>					5103 VA	4581 VA	4581 VA						
<b>Total Amps:</b>					43 A	38 A	38 A						
<b>Lighting Connected Load</b>					<b>Power Connected Load</b>			<b>Total Connected KVA</b>					
500 VA					14288 VA			14788 VA					
<b>Lighting Estimated Demand</b>					<b>Power Estimated Demand</b>			<b>Total Estimated Demand</b>					
500 VA					14288 VA			14788 VA					

Notes:  
1. CONTRACTOR TO UTILIZE EXISTING CIRCUIT BREAKERS FOR NEW WORK.  
2. PROVIDE 60A, 3P CIRCUIT BREAKER FOR NEW PANEL ERPS. CIRCUIT BREAKER TO MATCH EXISTING TYPE.

EXISTING Panelboard: 1B-SEC2													
Panel	Voltage			Phase			Wires			Mains Rating			Main Type
1B-SEC2	120/208 Wye			3			4			400 A			MLO
Mounting	Enclosure			Location			Supply From			MCB Rating			A.I.C. Rating
SURFACE	TYPE 1			EX. ELEC 103						225 A			14,000
Circuit Description	Wire Size	Trip	Poles	CKT	A	B	C	CKT	Poles	Trip	Wire Size	Circuit Description	
TRAINING ROOM 4	1-#12, 1-#12, 1-#12	20 A	1	1	900 VA / 0 VA			2	1	20 A	--	EXISTING LOAD	
TRAINING ROOM 4	1-#12, 1-#12, 1-#12	20 A	1	3		720 VA / 0 VA		4	1	20 A	--	EXISTING LOAD	
VAV-122 CORRIDOR	1-#12, 1-#12, 1-#12	20 A	1	5			100 VA / 0 VA	6	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	7	0 VA / 0 VA			8	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	9		0 VA / 0 VA		10	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	11			0 VA / 0 VA	12	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	13	0 VA / 0 VA			14	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	15		0 VA / 0 VA		16	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	17			0 VA / 0 VA	18	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	19	0 VA / 0 VA			20	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	21		0 VA / 0 VA		22	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	23			0 VA / 0 VA	24	1	20 A	--	EXISTING LOAD	
TRAINING ROOM 4	1-#12, 1-#12, 1-#12	20 A	1	25	540 VA / 540 VA			26	1	20 A	1-#12, 1-#12, 1-#12	TRAINING ROOM 4	
TRAINING ROOM 4	1-#12, 1-#12, 1-#12	20 A	1	27		540 VA / 180 VA		28	1	20 A	1-#12, 1-#12, 1-#12	TRAINING ROOM 4	
Power Space 198	1-#12, 1-#12, 1-#12	20 A	1	29			180 VA / 0 VA	30	--	--	--	BUSSED SPACE	
BUSSED SPACE	--	--	--	31	0 VA / 0 VA			32	--	--	--	BUSSED SPACE	
BUSSED SPACE	--	--	--	33		0 VA / 0 VA		34	--	--	--	BUSSED SPACE	
BUSSED SPACE	--	--	--	35			0 VA / 0 VA	36	--	--	--	BUSSED SPACE	
NOT AVAILABLE	--	0 A	1	37	0 VA / 0 VA			38	1	0 A	--	NOT AVAILABLE	
NOT AVAILABLE	--	0 A	1	39		0 VA / 0 VA		40	1	0 A	--	NOT AVAILABLE	
NOT AVAILABLE	--	0 A	1	41			0 VA / 0 VA	42	1	0 A	--	NOT AVAILABLE	
<b>Total Load:</b>					1980 VA	1440 VA	1440 VA						
<b>Total Amps:</b>					18 A	13 A	13 A						
<b>Lighting Connected Load</b>					<b>Power Connected Load</b>			<b>Total Connected KVA</b>					
0 VA					3700 VA			3700 VA					
<b>Lighting Estimated Demand</b>					<b>Power Estimated Demand</b>			<b>Total Estimated Demand</b>					
0 VA					3700 VA			3700 VA					

Notes:  
1. CONTRACTOR TO UTILIZE EXISTING CIRCUIT BREAKERS FOR NEW WORK.  
2. PROVIDE 20A, 1 POLE CIRCUIT BREAKER FOR NEW CIRCUITS. CIRCUIT BREAKER TO MATCH EXISTING TYPE.

EXISTING Panelboard: ERPS													
Panel	Voltage			Phase			Wires			Mains Rating			Main Type
ERPS	120/208 Wye			3			4			125 A			MLO
Mounting	Enclosure			Location			Supply From			MCB Rating			A.I.C. Rating
SURFACE	TYPE 1						ERPE			225 A			
Circuit Description	Wire Size	Trip	Poles	CKT	A	B	C	CKT	Poles	Trip	Wire Size	Circuit Description	
SUMP PUMP	1-#12, 1-#12, 1-#12	20 A	1	1	1440 VA / 1200 VA			2	1	15 A	1-#12, 1-#12, 1-#12	DRYER (CO-30)	
EWH (SKW)	2-#8, 1-#10	40 A	2	5		250 VA / 1941 VA		6	3	40 A	3-#8, 1-#10	DRYER CABINET (ADC)	
BUSSED SPACE	--	--	--	7	0 VA / 1941 VA			8			--		
WASHER	2-#12, 1-#12	20 A	2	9		2912 VA / 0 VA		10	1	20 A	--	SPARE	
SPARE	--	20 A	1	13	0 VA / 0 VA			14	1	20 A	--	SPARE	
SPARE	--	20 A	1	15		0 VA / 0 VA		16	1	20 A	--	SPARE	
SPARE	--	20 A	1	17			0 VA / 0 VA	18	1	20 A	--	SPARE	
SPARE	--	20 A	1	19	0 VA / 0 VA			20	1	20 A	--	SPARE	
BUSSED SPACE	--	--	--	21		0 VA / 0 VA		22	--	--	--	BUSSED SPACE	
BUSSED SPACE	--	--	--	23			0 VA / 0 VA	24	--	--	--	BUSSED SPACE	
<b>Total Load:</b>					4581 VA	5103 VA	5103 VA						
<b>Total Amps:</b>					38 A	43 A	43 A						
<b>Lighting Connected Load</b>					<b>Power Connected Load</b>			<b>Total Connected KVA</b>					
500 VA					14288 VA			14788 VA					
<b>Lighting Estimated Demand</b>					<b>Power Estimated Demand</b>			<b>Total Estimated Demand</b>					
500 VA					14288 VA			14788 VA					

Notes:  
1. PROVIDE 60A, 3P CIRCUIT BREAKER FOR NEW PANEL ERPS. CIRCUIT BREAKER TO MATCH EXISTING TYPE.

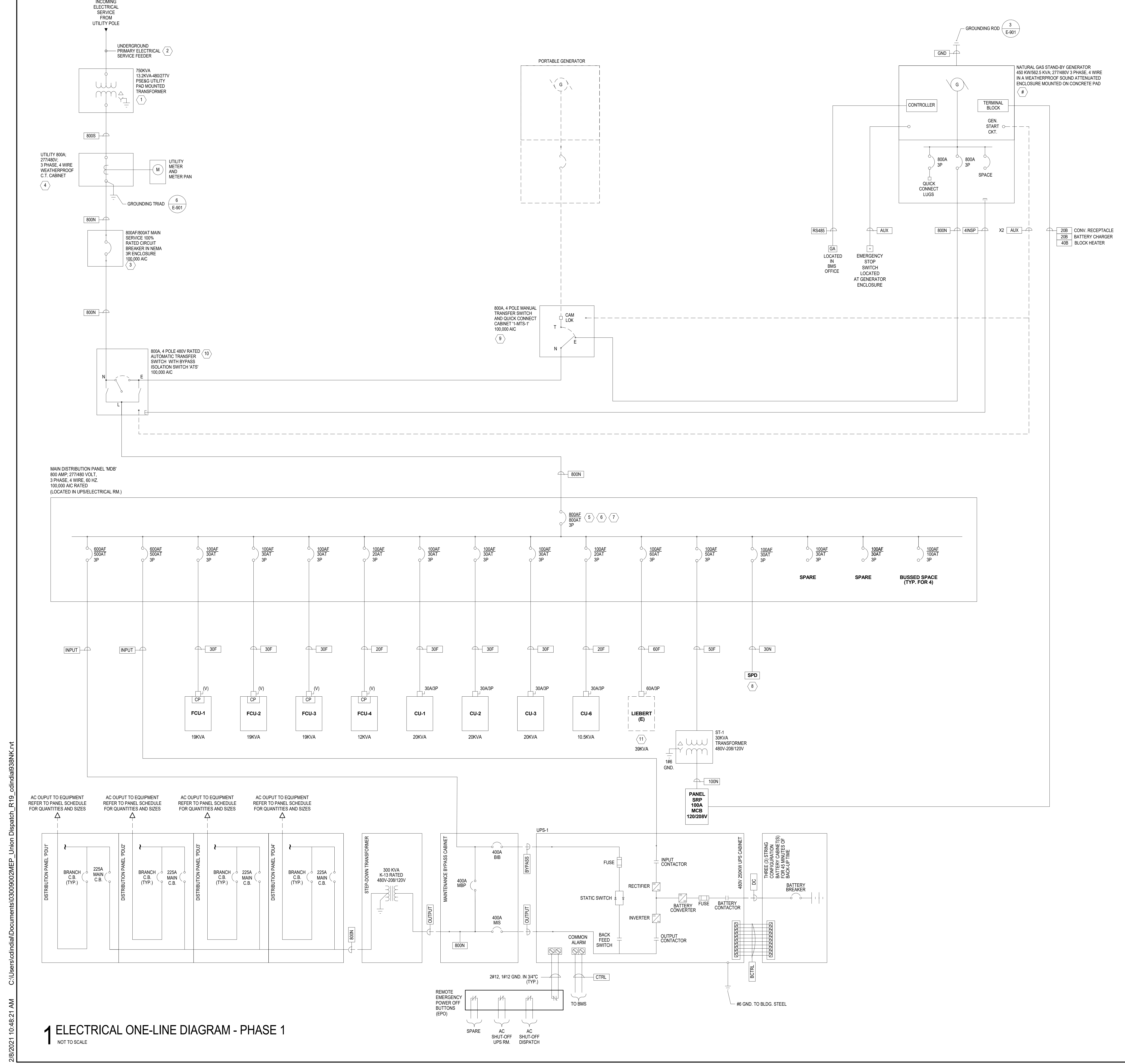
EXISTING Panelboard: 1EB													
Panel	Voltage			Phase			Wires			Mains Rating			Main Type
1EB	120/208 Wye			3			4			250 A			MLO
Mounting	Enclosure			Location			Supply From			MCB Rating			A.I.C. Rating
SURFACE	TYPE 1			EX. ELEC 103						225 A			10,000
Circuit Description	Wire Size	Trip	Poles	CKT	A	B	C	CKT	Poles	Trip	Wire Size	Circuit Description	
EXISTING LOAD	--	20 A	1	1	0 VA / 0 VA			2	1	20 A	--	EXISTING LOAD	
EXISTING LOAD	--	20 A	1	3		0 VA / 192 VA		4	1	20 A	1-#12, 1-#12, 1-#12	LIGHTING DISPATCH	
EXISTING LOAD	--	20 A	1	5			0 VA / 0 VA	6	1	20 A	1-#12, 1-#1		











### ONE-LINE SYMBOL LEGEND

SYMBOL	DESCRIPTION
	POWER TRANSFORMERS RATING AS SHOWN
	AUTOMATIC TRANSFER SWITCH
	CURRENT TRANSFORMERS
	POTENTIAL TRANSFORMERS
	METER
	CIRCUIT BREAKER
	DISCONNECT SWITCH / FUSED DISCONNECT SWITCH
	MOTOR
	DENOTES CONNECTION
	DISCONNECT SWITCH AND FUSE
	DASHED LINE ILLUSTRATES EXISTING EQUIPMENT
	TICK MARK ILLUSTRATES EXISTING EQUIPMENT TO BE REMOVED
	SURGE PROTECTIVE DEVICE
	FEEDER AND/OR CABLE TAG, NUMBER DENOTES SIZE OR TYPE

### FEEDER SCHEDULE

TAG NO.	FEEDER DESCRIPTION	CONDUIT SIZE
20B	2#12 AWG, 1#12 GND.	3/4"
20F	3#12 AWG, 1#12 GND.	3/4"
30F	3#10 AWG, 1#10 GND.	3/4"
30N	4#10 AWG, 1#10 GND.	3/4"
40B	4#8 AWG, 1#8 GND.	3/4"
50F	3#8 AWG, 1#10 AWG GND.	1"
60F	3#8 AWG, 1#10 AWG GND.	1"
100F	3#3 AWG, 1#8 AWG GND.	1-1/4"
100N	4#3 AWG, 1#8 AWG GND.	1-1/4"
800S	2 SETS OF: 4#600KCMIL	(2) 4"
800N	2 SETS OF: 4#600KCMIL, 1#30 GND.	(2) 4"
4INSP	EMPTY	4"
INPUT	3 SETS OF: 3#2, 1#2 GND.	(3) 2"
OUTPUT	3 SETS OF: 3#2, 1#2 GND.	(3) 2"
BYPASS	3 SETS OF: 3#2, 1#2 GND.	(3) 2"
DC	7#500KCMIL, 1#10 GND.	(1) 4"
RS485	RS485 TWISTED SHIELDED PAIR CABLE	2"
AUX	3#12 AWG FOR GENERATOR REMOTE START CIRCUIT AND FOR MONITORING THE INTEGRITY OF THE REMOTE START CIRCUIT	2"

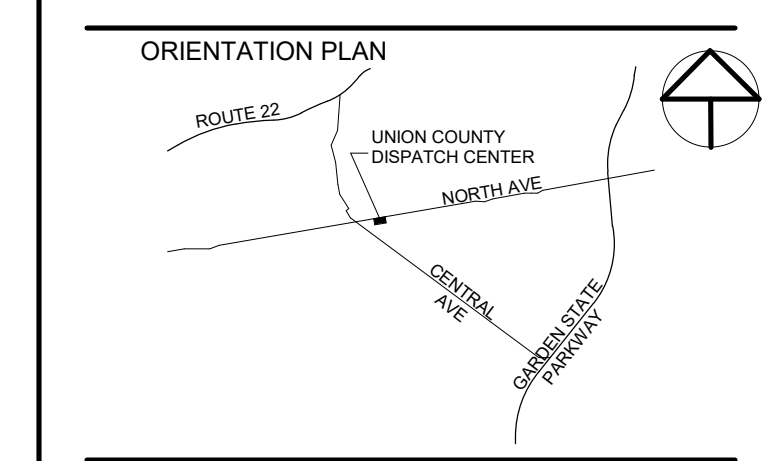
- ### GENERAL NOTES
- REFER TO ELECTRICAL GENERAL NOTES AND ELECTRICAL LEGEND ON DRAWING E-001.
  - ALL CONDUIT RUN BELOW GRADE SHALL BE SCHEDULE 40 PVC.

- ### SHEET KEYNOTES
- CONTRACTOR SHALL PROVIDE CONCRETE PAD FOR UTILITY TRANSFORMER IN ACCORDANCE WITH UTILITY INSTALLATION REQUIREMENTS. COORDINATE ALL ELECTRICAL SERVICE WORK WITH UTILITY COMPANY (PSE&G) PRIOR TO INSTALLATION.
  - THE CONTRACTOR SHALL FURNISH AND INSTALL ELECTRICAL PRIMARY ELECTRICAL SERVICE CONDUITS AND/OR PULLBOXES (WHERE APPLICABLE) FROM OVERHEAD UTILITY POLE TO PAD MOUNTED TRANSFORMER. COORDINATE ELECTRICAL SERVICE REQUIREMENTS WITH UTILITY COMPANY (PSE&G) PRIOR TO INSTALLATION.
  - CONTRACTOR SHALL PROVIDE AN 800A, 3 POLE MAIN SERVICE CIRCUIT BREAKER, 100% RATED AT 480V IN A NEMA 3R WEATHERPROOF ENCLOSURE. SWITCH WITHSTAND/CLOSE RATING SHALL BE 65,000A<sup>2</sup> FOR 20 MS (3 CYCLES). COORDINATE SPECIFIC CIRCUIT BREAKER TYPES AND RATINGS WITH PANELBOARD MANUFACTURER, PRIOR TO PURCHASE.
  - UTILITY METER PAN SOCKET SHALL BE PROVIDED BY UTILITY COMPANY (PSE&G). CONTRACTOR SHALL COORDINATE ALL METERING REQUIREMENTS WITH UTILITY COMPANY, PRIOR TO INSTALLATION.
  - PROVIDE 10% RATED ELECTRONIC ALSO MAIN SERVICE CIRCUIT BREAKER WITH GROUND FAULT PROTECTION. PROVIDE LABEL STATING MAXIMUM AVAILABLE FAULT CURRENT. THE LABEL SHALL INCLUDE THE DATE THE FAULT CURRENT CALCULATION WAS PERFORMED AND WHOM IT WAS PERFORMED BY.
  - SHORT CIRCUIT STUDY: PROTECTIVE DEVICE EVALUATION STUDY, ARC FLASH AND PROTECTIVE DEVICE COORDINATION STUDY SHALL BE PERFORMED BY THE SWITCHBOARD MANUFACTURER. THE ELECTRICAL CONTRACTOR SHALL THEN SUBMIT STUDIES TO THE ENGINEER FOR REVIEW OF THE DISTRIBUTION EQUIPMENT SHOP DRAWINGS AND/OR PRIOR TO RELEASE OF EQUIPMENT FROM MANUFACTURER. NO INSTALLATION OF THE ELECTRICAL EQUIPMENT SHALL BEGIN PRIOR TO THE REVIEW AND APPROVALS OF THE ENGINEER.
  - PS&S PERFORMED A PRELIMINARY FAULT CURRENT CALCULATION BASED ON THE MAXIMUM AVAILABLE FAULT CURRENT OF 65,000A AT THE SECONDARY SIDE OF THE UTILITY TRANSFORMER. ONCE THE FAULT CURRENT IS OBTAINED FROM THE LOCAL UTILITY COMPANY (PSE&G), A FINAL FAULT CURRENT STUDY SHALL BE PROVIDED BY MANUFACTURER OF EQUIPMENT TO BE INSTALLED OR BY A THIRD PARTY CONSULTANT, PRIOR TO THE RELEASE OF THE ELECTRICAL SWITCHBOARD, UPS, PANELBOARDS AND OTHER DISTRIBUTION EQUIPMENT.
  - CONTRACTOR SHALL PROVIDE SURGE PROTECTION DEVICE FOR SERVICE UNIT SHALL BE TYPE 1, RATED AT 200KA, 800VA (L1448, 3RD EDITION) - MOUNTED IN A NEMA 1 ENCLOSURE, MANUFACTURED BY ERITECH #SES200 OR APPROVED EQUAL. MOUNT UNIT ADJACENT TO SERVICE SWITCH AND KEEP CABLE LENGTH AS SHORT AS POSSIBLE.
  - CONTRACTOR SHALL PROVIDE MANUAL TRANSFER SWITCH WITH INTEGRATED QUICK CONNECTS FOR TEMPORARY PORTABLE GENERATOR POWER CONNECTION. TRANSFER SWITCH UNIT SHALL BE MANUFACTURED BY ASCO SERIES 300 MTS OR APPROVED EQUAL. SWITCH SHALL BE AN 800A, 480 VOLT RATED, 3 POLE WITH SWITCH NEUTRAL IN A NEMA 3R WEATHERPROOF ENCLOSURE. SWITCH TO BE PROVIDED QUICK CONNECTED INTEGRATED PANEL UTILIZING STANDARD CAM-LOCK RECEPTACLES FOR QUICK CONNECTION OF PORTABLE GENERATOR.
  - CONTRACTOR SHALL PROVIDE AUTOMATIC TRANSFER SWITCH WITH BYPASS ISOLATION SWITCH MANUFACTURED BY ASCO SERIES 7000 OR APPROVED EQUAL. SWITCH SHALL BE AN 800A, 480V RATED, 4 POLE WITH SWITCH NEUTRAL WITH SIDE GUTTER IN A NEMA 1 ENCLOSURE.
  - CONTRACTOR SHALL PROVIDE NEW 100A/60AT CIRCUIT BREAKER FOR EXISTING AC LIEBERT UNIT TO BE DISCONNECTED FROM EXISTING SERVICE AND RE-CONNECTED TO NEW SERVICE DISTRIBUTION PANEL AS INDICATED ON PLANS UNDER PHASE 2 WORK.

ISS / REV	DATE	ISSUE DESCRIPTION
0	08/31/20	ISSUED FOR BID
1	02/08/21	ISSUED FOR BID REV 1

CLIENT

CONSULTANT



PALLIUS SOKOLOWSKI AND SARTOR ENGINEERING, PC  
 67A MOUNTAIN BOULEVARD EXTENSION  
 P.O. Box 4039  
 WARREN, NEW JERSEY 07059  
 TEL: 732.560.9700

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**Fred F. Chen**  
 Professional Engineer - New Jersey  
 License no. 52950

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

CLIENT

**Union County Div of Engineering**

PROJECT

**UNION COUNTY DISPATCH CENTER AREA EXPANSION**

FROELICH BUILDING  
 NORTH AVENUE  
 WESTFIELD, NEW JERSEY

SHEET NAME

**ELECTRICAL ONELINE NEW WORK**

JOB NO.: 03009002  
 DATE: 08/31/2020  
 DRAWN: SEO  
 CHECK: RKS  
 SCALE: 12" = 1'-0"

SHEET NO.











