PROJECT MANUAL FOR:

RENOVATIONS FOR ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DRIVE, VINELAND, NJ 08360

FOR:

Cumberland County Improvement Authority
745 Lebanon Road
Millville, NJ 08332

ARCHITECT
Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue #4
Vineland, NJ 08360

MECHANICAL/PLUMBING/ELECTRICAL ENGINEER
BCCLT Consulting Engineers
1138 East Chestnut Street
Vineland, NJ 08360

March 26, 2019

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CUMBERLAND COUNTY IMPROVEMENT AUTHORITY

745 Lebanon Road
Millville, NJ 08332

BID SPECIFICATIONS FOR:

RENOVATIONS TO:
ENGINEERING LAB
CUMBERLAND COUNTY COLLEGE

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NOTICE TO CONTRACTORS
INVITATION TO BID

The Cumberland County Improvement Authority ("Authority") shall receive sealed bids at 745 Lebanon Road, Millville, New Jersey 08332 until **1:00 PM, prevailing time Thursday, April 18, 2019** to be publicly opened, and read aloud for:

RENOVATIONS TO: ENGINEERING LAB
CUMBERLAND COUNTY COLLEGE

There will be a non-mandatory **Pre-Bid Meeting** for all interested Contractors, on **Tuesday, April 2, 2019 at 10:00 AM.** Bidders will meet at the **Navone Healthcare Building**. After a meeting, the project site will be available for review.

Bids must be submitted on the standard Bid Proposal forms provided by the Authority in the manner designated in the Request for Bids, must be enclosed in a sealed envelope bearing the title of the bid, name and address of the Contractor on the outside, and must be addressed to Cumberland County Improvement Authority, and delivered to the above address at the date, time and place set forth herein. The Cumberland County Improvement Authority is not responsible for any bids that do not arrive at the proper time or location; any such bid will be returned unopened to the vendor. All documents contained in this package must be returned to the Cumberland County Improvement Authority in their original form. No substitutions, alterations, or modifications of any of the bid documents are permitted.

The Cumberland County Improvement Authority requires that all Bidders submit with its bid, a bid guarantee in the form of a bid bond, certified check, or cashier's check in the amount of ten percent (10%) of the bid, but in no case shall the bid guarantee exceed twenty thousand dollars ($20,000). Bid bonds shall be from a surety company licensed to do business in the State of New Jersey, with a minimum A- rating by AM Best, and acceptable to the Authority. Bonds that are signed by an Attorney-in-Fact shall be accompanied by a certified Power-of-Attorney. **Failure to include these items will mandate rejection of bid.**

Drawings and Specifications (electronic format only) can be obtained from http://www.ccia-net.com, the website of the Cumberland County Improvement Authority upon a non-refundable payment of $15.00. Documents will be available beginning **Tuesday, March 26, 2019**. Questions regarding the bid must be made via e-mail to **misaacson@ccia-net.com** Subject: **Renovations for New Engineering Lab**. All questions must be received no later than **Friday, April 5, 2019 at 4:00 PM**.

Bidders also will be required to submit performance security, in the form of a performance bond, in an amount equal to one hundred percent (100%) of the value of the Contract. At the time of bid submission, all Bidders will be required to submit a Consent of Surety indicating that such surety will provide the performance bond if the Bidder is awarded a contract.

No bid may be withdrawn for a period of sixty (60) days after the date set for the opening thereof except in accordance with N.J.S.A. 40A:11-23.3.

This bid is being solicited through fair and open process in accordance with the requirements of N.J.S.A. 19:44A-20.4, and shall be procured and awarded in conformance with the applicable requirements of the "Local Public Contracts Law," N.J.S.A. 40A:11-1 et seq.

Bidders are required to comply with the requirements of N.J.S.A. 10:2-1 (Anti-Discrimination in Employment), N.J.S.A. 10:5-31 et seq. and N.J.A.C.17:27 et seq. (Equal Employment Opportunity), 42 U.S.C. § 12101 et seq.

(Americans with Disabilities Act), N.J.S.A. 52:32-44 (New Jersey Business Registration), and N.J.S.A. 52:25-24.2 (Ownership Disclosure Certification). .

Successful Bidders and subcontractors must provide a copy of their State of New Jersey Business Registration Certificate issued by the New Jersey Department of Treasury prior to the time a contract is awarded or authorized.

Bidders shall not submit bids with qualifying conditions or provisions.

The Authority reserves the right to consider the bids for sixty (60) days after receipt thereof, and further reserves the right to reject all bids, waive informalities, and make such awards or take action as may be in the best interest of the Authority, in accordance with applicable law.

ln order to encourage full participation in this opportunity, submit any requests for accommodations of people with disabilities to the Cumberland County Improvement Authority (856) 825-3700. People who are deaf, hard of hearing and/or speech impaired should access this service by contacting the NJ Relay Service at 1-800-852-7899-(TTY).

BY ORDER OF THE CUMBERLAND COUNTY
IMPROVEMENT AUTHORITY
CUMBERLAND COUNTY, NEW JERSEY

Gerard Velazquez, III
President/CEO

INSTRUCTIONS TO CONTRACTORS

1.1. THE BID

The Cumberland County Improvement Authority is soliciting sealed bid proposals from companies interested in providing Construction services within the designated areas of the County, in accordance with the terms of these bid specifications and N.J.S.A. 40A:11-1 et seq. and any amendments thereto. Bids will be received by **1:00 PM prevailing time on Thursday, April 18, 2019** at the Cumberland County Improvement Authority ("CCIA", "Authority" or "Owner" as used herein) located at 745 Lebanon Road, Millville, New Jersey 08332. Bids shall include (1) original and (2) copies. Original should be stamped original.

Before submitting a Proposal, Bidders shall become familiar with the Drawings, Specifications and other documents that will from the Contract, shall investigate the site of the Project and make such examination thereof as may be necessary to determine the character and amount of work involved. It shall also determine that it can secure the necessary labor and equipment and that the materials it proposes to use will comply with the requirements specified therefore and can be obtained by it in the quantities and at the time required.

The Authority reserves the right to accept, reject and waive any informalities in the bid or reject all bids including Alternate Bids, if any, in accordance with applicable law. Any bid received after the time and date specified will not be considered. No bidder shall withdraw a bid within sixty (60) days after actual date of the opening thereof except in accordance with N.J.S.A. 40A:11-23.3.

The Bid Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Notice to Bidders, the Instructions to Bidders, any Supplementary Instructions to Bidders, the Proposal Forms and any other bidding and contract forms included or referenced in the Specifications. The Contract Documents consist of the form of Agreement between the Authority and Successful Bidder, Conditions of the Contract (General, Supplementary and any other Conditions), the Bid Documents, Drawings, Specifications and all Addenda issued during the bidding period, and a copy of the Project Labor Agreement. A copy of all documents included on the Bid Document Checklist are required to be included in the Bid Proposal.

Bid Documents, Drawings and Specifications can be obtained electronically through the Authority's website Portal (Quest), under the Public Information tab on the website of the Cumberland County Improvement Authority, https://www.ccia-net.com/, and upon a non-refundable payment of $15.00, made through the Portal.

At the time of the opening of bids each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Bid Documents and Drawings and other Contract Documents, including all properly noticed Addenda. The failure or omission of any Bidder to receive or examine any form included in the bid packet or properly noticed as an addendum to the bid packet, or any other instrument or document the bidder deems necessary and appropriate, or to visit the site and acquaint itself with conditions there existing, shall not relieve any Bidder from any obligation with respect to its bid.

1.2. CHANGES TO THE BID SPECIFICATIONS

Notice of revisions or addenda to the advertisements or bid documents relating to bids will be provided to each Bidder in accordance with N.J.S.A. 40A:11-23(c)(2), no later than seven (7) days, Saturdays, Sundays and

Holidays excepted, prior to the date for acceptance of bids, and will be published on the website Portal of the Cumberland County Improvement Authority.
During the bidding period, the Authority may furnish Addenda for additions to or alterations of the drawings and specifications, which shall be included in the work covered by the Proposals. Addenda will be published on the website Portal of the Cumberland County Improvement Authority and either (i) certified facsimile that provides date and time of transmission to the Authority or (ii) by electronic delivery that provides certification or delivery to the Authority, not later than seven (7) days (Saturday, Sundays and holidays excepted) before Bid opening, and will be provided to all Contractors in accordance with N.J.S.A. 40A:11-23(c)(2); however, the CCIA shall not be responsible for the failure of receipt of properly noticed Addenda by any one Bidder. It shall be the responsibility of the Bidder to ascertain that it has received all addenda issued prior to submitting its bid.

All Addenda properly noticed and issued, whether or not received or examined by the Bidder, are part of the Bid Documents, and will be binding on the Bidder as though originally incorporated in the Bid Documents. Failure of the Bidder to receive or examine any properly noticed Addendum shall not relieve the Bidder from any of the requirements of the Bid Documents.

The Bidder shall carefully study the Bid Documents and compare them with each other, shall examine the Project site and local conditions, and shall immediately report to the Authority in writing any errors, inconsistencies and ambiguities discovered.

No oral interpretations will be made to any Bidder as to the meaning of the Bid Documents, drawings and specifications. **Questions regarding the bid must be made via e-mail to misaacson@ccia-net.com on or before Friday, April 5, 2019 at 4:00 PM**.

The Authority shall respond in writing to inquiries received by such date. No inquiry received after the above date will be given consideration. Interpretations and clarifications made to any Bidder question will be in the form of an Addendum which, when issued, will be sent promptly to all persons to whom the drawings and specifications have been issued. If no response is provided to a submitted question Bidder shall assume that no change to the Bid Documents is considered necessary or desirable in response to the question.

Bids are requested on the project stated in the Bid Proposal Form. The prices shall cover all costs, of any nature, incidental to and growing out of the work. ln explanation, but not in limitation thereof, these costs shall include the cost of all work, labor, materials, equipment, and transportation necessary to perform and complete the project in the manner and within the time required, all incidental expenses in connection therewith, all costs on account of loss by damage or destruction of the project, and any additional expenses for unforeseen difficulties encountered, for settlement of damages and for replacement of defective work and materials. Conditions, limitations or provisions attached to the proposal by the Bidder may be cause for rejection of the bid. Any changes, whiteouts, strikeouts, etc. in the bid must be initialed in ink by the person signing the bid.

2. BID SUBMISSION REQUIREMENTS

2.1. BID PROPOSAL

A. Each document in the Bid Proposal must be properly completed in accordance with these bid specifications. No Bidder shall submit the requested information on any form other than those provided in these specifications. **Bid Proposal Form and all required forms (as noted on Bid Document Checklist) are supplied herewith. They shall be returned in sealed envelopes addressed:**

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The envelope shall bear on the outside the name of the Bidder, its address, and its license number, if applicable**. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to the Authority.** Bid Document pages are not to be stapled or bound together.

The Authority accepts no liability for bids opened in error due to absence of such notation.

B. One (1) original and at least two (2) copies of all Bid Proposals shall be hand delivered or mailed in a sealed envelope, and the name and address of the Contractor and the name of the Bid as set forth in the Public Advertisement for Bids must be written clearly on the outside of the sealed envelope. In addition and for the convenience of the Authority only, an electronic copy (thumb drive or similar) of all bid materials, less the Bid Proposal Form, shall be included in the sealed envelope. Electronic copy of the Bid Proposal Form shall be provided within 24 hours of the Bid Due deadline, and sent to misaacson@ccia-net.com. No Bid Proposal will be accepted past the date and time specified by the Cumberland County Improvement Authority in the Notice to Bidder.

C. Each Bidder shall sign, where applicable, all bid submissions as follows:

1. For a corporation, by a principal executive officer;
2. For a partnership or sole proprietorship, by a general partner or the proprietor respectively;
3. For a limited liability company by its Manager or authorized Members; or
4. A duly authorized representative if:
    a. The authorization is made in writing by a person described in paragraphs 1 and 2 above; and
    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the business.

D. Bid Proposals shall be submitted on the Bid Proposal Form furnished in the bid documents, properly filled out and duly executed. Bid Proposal forms shall not be altered or added to in any way. Lump Sum Bid or Base prices shall be filled in, in ink or typewritten in both words and figures. In case of discrepancy, the amount described in words shall govern. All blank spaces in the Bid Proposal Form must be filled out or completed by the Bidder. Incomplete spaces on the Bid Proposal Form may be reason for rejection of bid.

E. Any Bid Proposal that does not materially comply with the requirements of the Bid Specifications shall be rejected as non-responsive.

F. When the proposal is made by an individual, his post office address shall be stated and he shall sign the proposal. When made by a firm or partnership or limited liability company, its name and post office address shall be stated and the proposal shall be signed by one or more of the partners or members, as

appropriate. When made by a corporation, its name and principal post office address shall be stated, and the proposal shall be signed by an authorized official of the corporation.

Each Bidder shall include with its Bid, for itself and for each of the proposed Subcontractors (Subcontractor list) the following:

In accordance with "the Public Works Contractor Registration Act" (P.L.1999, c.238) each Contractor, and each of its subcontractors, should submit prior to contract award a copy of its Public Works Contractor Registration Certificate from the New Jersey Department of Labor.

Contractors submitting Proposals pursuant to N.J.S.A. 40A:11-16 shall include names of subcontractors proposed for use in performance of Structural Steel; Plumbing, Drainage and Sprinkler; Heating, Ventilation and Air Conditioning, Electrical Work.

Bids not based on the Bid Documents (including all Addenda issued), Bids containing a qualification or exception to the requirements of the Bid Documents, conditional or uninvited alternative Bids, Bids that are not complete or properly signed for, Bids not submitted in accordance with the requirements of the Bid Documents, and Bids containing an alteration of a form or irregularity of any kind may be rejected in accordance with applicable law.

Bids may also be rejected for any of the following reasons:

1. All bids pursuant to N.J.S.A. 40A:11-13.2.

2. More than one bid is received from an individual, firm or partnership, corporation or association under the same name.

3. Receipt of multiple bids from an agent representing competitive bidders.

4. The bid is inappropriately unbalanced.

5. The Authority determines the bidder is determined pursuant to N.J.S.A. 40A:11-4(b) to have Prior Negative Experience.

6. If the successful Bidder fails to enter into a contract within 21 days of award, Sundays and holidays excepted, or as otherwise agreed upon by the parties to the contract. In this case, at its option, the Authority may accept the Bid of the next lowest responsible bidder (N.J.S.A. 40A:11-24(b)) and retain the bid bond of the initial successful Bidder.

Each Bid shall include or be accompanied by:

(i) Bid Security made payable to **the Cumberland County Improvement Authority** in the amount of ten percent (10%) of the greatest possible Bid sum, but not to exceed $20,000.00. Securities shall be either certified check, cashier's check, or Bid Bond by a surety licensed to conduct business in New Jersey.

a. A successful Bidder's bid security will be retained until the Bidder has signed the Contract and furnished the required Performance Bond(s) and Labor and Materials Payment Bond(s).

b. The Authority reserves the right to retain the bid securities of the three (3) lowest responsible Bidders for up to three (3) days (Sundays, and holidays excepted) after the awarding and signing of the Contract with the successful Bidders and the approval of the Bidder's bonds, or until sixty (60) days after Bid opening, whichever occurs first. All other bid securities will be returned within ten (10) days (Sundays and holidays excepted) after opening of Bids.

c. If the Successful Bidder fails to enter into a Contract and furnish the required bonds within (10) days after it has received notice of acceptance of its Bid, the Authority will retain that Contractor's bid security as liquidated damages, not as a penalty.

(ii) Consent of Surety, in accordance with N.J.S.A. 40A:11-22, from a surety company licensed to conduct business in New Jersey, stating that it will provide the Bidder (and Subcontractors identified by the Bidder), if the Bidder is awarded the Contract, with the required Performance Bond and the required Labor and Material Payment Bond along with a surety disclosure statement and certification for each bond.

a. If the Bidder is awarded a Contract, performance and payment securities may be supplied by those individual Subcontractors on behalf of themselves and the Bidder, by the Bidder on behalf of itself and any or all of those Subcontractors, or by any combination thereof as long as the amount of the resulting Performance Bond(s) equals the total Contract Sum and the amount of the resulting Payment Bond(s) equals the total Contract Sum and all of these bonds name the Bidder as a principal. If the Bidder furnishes its Bonds covering itself and any subcontractor, only the Bidder need be named as a Principal.

b. Any consent of Surety furnished by a proposed Subcontractor shall specify the dollar value of the Subcontractor's portion of the Work and shall name both the Bidder and the Subcontractor as the proposed principal obligees.

c. If the Bidder proposes to furnish bonds that cover both the Bidder and one or more of its Subcontractors, the Consent of Surety shall specify the dollar value of the Work covered and shall name the Bidder and cover the work of each Subcontractor included therein.

d. The bonding company or companies shall be NJ Department of Insurance and Banking approved, shall have an A.M. Best Company rating of "A-" or better and meet all the requirements of N.J.S.A. 2A: 44-143.

(iii). Subcontractor List – Failure to identify on the Bid Proposal all of the Subcontractors, persons and entities to be engaged for the work identified by N.J.S.A. 40A:11-16 shall be cause for the bid to be rejected.

(iv). Non-Collusion Affidavit.

(v). Ownership Disclosure Statement setting forth names and addresses of all stockholders, members or partners who hold ten percent (10%) or greater interest in any corporation or partnership or limited liability company bidding on the Project or owning ten percent (10%) or greater interest in the bidder or any of its disclosed interest-holders, in accordance with N.J.S.A. 52:25-24.2.

(vi). A letter from the Bidder's insurance company stating that if the Bidder is awarded the Contract the insurance company will, within ten (10) days of award, furnish the Bidder with a policy or policies of insurance of the types and in the amounts required by the Contract.

(vii). Bidder's acknowledgement of receipt of any notice(s) or revision(s) or addenda to the specifications of the bid document(s).

(viii). Such other items as set forth in the Bid Proposal Form or Bidder's checklist.

2.2. BID GUARANTEES

A Bid Guarantee in the form of a Bid Bond, Cashier's Check or Certified Check, made payable to the Cumberland County Improvement Authority in the amount of ten percent (10%) of the greatest possible bid, but not to exceed twenty thousand dollars ($20,000) must accompany each Bid Proposal. In the event that a Bidder to whom the Contract is awarded fails to enter into the Contract in the manner and within the time required, the award to the Bidder shall be rescinded and the bid guaranty shall become the property of the Cumberland County Improvement Authority.

Failure to submit a Bid Guarantee shall result in the rejection of the bid.

Pursuant to N.J.S.A. 40A:11-24, all Bid Guarantees, except those of the three apparent lowest responsible Bidders, will be returned, unless otherwise requested by the bidder, within ten days after opening of bids, Sunday and holidays excepted. Within 3 days after the awarding of the contract and the approval of the Bidder's performance-payment bond, the bid security of the remaining unsuccessful Bidders will be returned, Sunday and holidays excepted.

The Bid Guarantee shall be forfeited if Bidder fails to execute the Agreement and furnish the Payment and Performance Bond, as per N.J.S.A. 2A:44-147, along with a Surety Disclosure Statement and Certification for each bond and any general Power of Attorney required, within ten (10) days after notification of award of Contract.

2.3 CONSENT OF SURETY

Pursuant to N.J.S.A. 40A:11-22, Proposals shall be accompanied by a Consent of Surety in the form found in these documents, assuring that satisfactory arrangements have been made between the surety and the Bidder by which the surety agrees to furnish the Bidder with a Payment and Performance Bond (Construction), as per N.J.S.A. 2A: 44-147, along with a Surety Disclosure Statement and Certification for each bond, any General Power of Attorney necessary, and the required Maintenance Bond. The Consent of Surety shall be executed by an approved surety company authorized to do business in the State of New Jersey or by the individual if an individual surety is being offered by the Bidder. The Surety Company must have a Best's rating of A- or better, and a Best's Financial Category of Vll or larger, the minimum ratings and the financial size categories are those listed for the Surety Company in the most current issues of Best's Key Rating Guide, Property- Casualty, published by the A.M. Best Company, Oldwick, NJ.

Pursuant to N.J.S.A. 40A:11-16(a)(3), Contractors submitting proposals for a Building Contract shall submit evidence of performance security simultaneously with the list of subcontractors. Evidence of performance security may be supplied by the Contractor on behalf of himself and any or all subcontractors, or by each respective subcontractor, or by any combination thereof which results in evidence of performance security equaling, but in no event exceeding, the total bid amount.

Failure to submit a Consent of Surety shall result in rejection of the bid.

2.4. CONTRACT BONDS

PAYMENT AND PERFORMANCE BOND: Successful Bidder shall simultaneously with the delivery of the executed contract, submit an executed bond in the amount of one hundred (100%) percent of the acceptable bid as security for the faithful payment under, and performance of this contract. The Payment and Performance bond provided shall not be released until final acceptance of the whole work and then only if any liens or claims have been satisfied. The surety on such bond or bonds shall be a duly authorized surety company authorized to do business in the State of New Jersey pursuant to N.J.S.A. 17:31-5.

Failure to submit the Payment and Performance Bond with the executed contract shall be cause for declaring the contract null and void.

MAINTENANCE BOND: Upon acceptance of the work by the Authority, the Successful Bidder shall submit a maintenance bond (N.J.S.A. 40A:11-16.3) in an amount not to exceed one hundred (100%) percent of the project costs guaranteeing against defective work or materials for the period of two (2) years.

2.5. EXCEPTIONS TO THE BID SPECIFICATIONS

Any conditions, limitations, provisos, amendments, or other changes attached to or added by the Bidder to any of the provisions of these Bid Specifications, or any changes made by the Bidder on the Proposal Forms shall result in the rejection of the Bid Proposal by the Cumberland County Improvement Authority.

2.6. SUBSTITUTIONS/MATERIALS

A. Whenever the Work Specifications identify a brand name, trade name or a manufacturer's name, this designation is used for classification or descriptive purposes only, and the Bidder may substitute an equal product, subject to the approval of the Cumberland County Improvement Authority.

B. Variations between the goods and services described and the goods and services offered are to be fully identified and described by the bidder in accordance with the A232, and any other references that included in these specifications. Vendor literature WILL NOT suffice in explaining exceptions to these specifications.

C. It is the responsibility of the Bidder to document and/or demonstrate the equivalency of the goods and services to be provided as “or equal” products. The Authority reserves the right to evaluate the equivalency of the goods and services.

D. In submitting its bid, the Bidder certifies that the goods and services to be furnished will not infringe upon any valid patent or trademark and that the successful bidder shall, at its own expense, defend any and all actions or suits charging such infringement, and will save the Authority harmless from any damages resulting from such infringement.

E. Only manufactured products of the United States, wherever available, shall be used pursuant to N.J.S.A. 40A: 11 -18.

F. The Bidder shall guarantee any or all goods and services supplied under these specifications. Defective or inferior goods shall be replaced at the expense of the Bidder. The Bidder will be responsible for return freight or restocking charges.

G. Substitution Requests will not be reviewed during bidding. Bidders may include substitutions in their bid at their risk. The successful bidder may then submit their substitution requests in accordance with the Contract Documents for approval of equivalency.

2.7. COMPLIANCE

The Bidder shall be familiar with and comply with all applicable local, state and federal laws and regulations in the submission of the Bid Proposal and, if the Bidder is awarded the Contract, in the performance of the Contract. These laws include, but are not limited to, N.J.S.A. 40A:11-1 et seq., and N.J.A.C. 5:34.

2.8. CONFLICT OF INTEREST AND NON-COLLUSION

The Bidder must execute and submit as part of the Bid Proposal a "Non-Collusion Affidavit."

2.9. NO ASSIGNMENT OF BID

The Bidder may not assign, sell, transfer or otherwise dispose of the Bid or any portion thereof or any right or interest therein. This Section is not intended to limit the ability of the successful Bidder to assign or otherwise dispose of its duties and obligations under the Contract provided that the Cumberland County Improvement Authority agrees to the assignment or disposition.

2.10 CONTRACT FORM

The form of agreement shall be the AIA A132 - 2009 Form of Agreement.

2.11 PAY TO PLAY

All business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of $50,000 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532 or at www.elec.state.nj.us.

2.12 REQUIRED SUBCONTRACTOR LISTING

Pursuant to N.J.S.A. 40A:11-16, Bidders must identify the subcontractors to whom it will subcontract the furnishing of (1) Steam and Hot Water Heating and Ventilating Apparatus, Steam Power Plants and all Kindred Work ; (2) Electrical Work; (3) Plumbing and Gas Fitting and all Kindred Work; (4) Structural Steel and Ornamental Iron Work.

3. AWARD OF CONTRACT

3.1. GENERALLY

A. The Cumberland County Improvement Authority will award the Contract or reject all bids within the time specified in the Invitation to Bid, but in no case more than sixty (60) days, except that the bids of any Bidders who consent thereto may, at the request of the Contracting Unit, be held for consideration for such longer period as may be agreed. All Bidders will be notified of the Authority's decision in writing.

B. A written request for the withdrawal of a bid will be granted if received by the Authority before any bid has been opened, in accordance with N.J.S.A. 40A:11-23.3. Upon proper request and identification, bids may be withdrawn as follows:

1. At any time prior to the designated time for opening of bids.
2. Provided the Proposal has not been accepted by the Authority, at any time subsequent to the expiration period during which the bidder has agreed not to withdraw his proposal.

Unless a proposal is formally withdrawn, it shall be deemed open for acceptance until the Contract Agreement has been executed by both parties thereto or until the Authority manifests that he does not intend to accept the Proposal Notice of acceptance of a Proposal shall not constitute rejection of any other Proposal.

C. Award(s), if made, will be to the lowest responsible Bidder, including Alternate Bids, if any, which the Authority chooses to accept, in accordance with N.J.S.A. 11-23.1.

D. Award made to a Bidder not a resident of the State is conditioned upon the Bidder designating a proper agent in the State on whom service can be made in the event of litigation.

E. If the successful Bidder is a corporation not organized under the laws of New Jersey, the award of Contract and payment of consideration thereunder shall be conditioned upon Corporation promptly filing a certificate of authority to do business in the State of New Jersey pursuant to N.J.S.A. 14A:13-2 and complying with the provisions of N.J.S.A. 14A:13-4.

F. Whenever two or more bids of equal amounts are the lowest bids submitted by responsible Contractors, the Authority may award the Contract to any one of such Bidders in accordance with N.J.S.A. 40A:11-6.1(d).

G. Any discrepancy between a numerical price and a price written in words shall be resolved in favor of the price as written in words. Any discrepancy between the individual unit price and the corresponding total price figure for all required units set forth in the proposal form(s) shall be resolved in favor of a total price reached by multiplying the unit price provided by the quantity to come to a total price. The corrected total shall be used to determine the award of the Contract. After all Bid Proposals have been read, the bids will be tabulated and adjusted, if necessary, in accordance with this paragraph. If any mathematical corrections must be made on any Bid Proposal, then the Cumberland County Improvement Authority may not award a contract until all tabulations are complete.

H. Note that no contract can be awarded to a Bidder appearing on the New Jersey Department of Labor's list of contractors not paying prevailing wages until after the indicated date of expiration of the Bidder's listing, in accordance with N.J.S.A. 34:11-56.37 and N.J.S.A. 34:11-56.38.

I. Successful Bidders shall keep an accurate record showing the name, craft or trade and actual hourly rate paid to each worker employed by him in connection with the project. The record shall be preserved for a period of five years from the date of final payment. Successful Bidder shall further post the prevailing wage rates for each craft and classification involved in the project in prominent and easily accessible places at the site of work and at such other places as are used by employer to pay workers.

J. Before the Authority will make final payment, Successful Bidder shall provide to the Authority a Payroll Verification Affidavit for each payroll period stating the wages then due to any and all workers for wages on account of the project. The affidavit shall certify that Successful Bidder has paid wages in accordance with the Prevailing Wage Act.

I. The Successful Bidder and its subcontractors awarded the Contract for the Project will be required to comply with:

(i). New Jersey "Law Against Discrimination", N.J.S.A. 10:5-1 et seq.
(ii). New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.27 et seq.
(iii). Certification and submission of payroll records for each pay period, N.J.A.C. 12:60-5.1.
(iv). Foreign product limitations, in accordance with N.J.S.A. 40A:11-18.
(v). Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48.
(vi). N.J.S.A. 2C:21-34 et seq. governing false claims and representations by Contractors; it is a serious crime for the Contractors to knowingly submit a false claim and/or knowingly make a material misrepresentation regarding a public contract.
(vii). N.J.S.A. 2C:27-2 et seq. provides that a person commits a crime if said person offers a benefit to a public servant for an official act performed or to be performed by a public servant, which is a violation of official duty.
(viii). N.J.S.A. 2C:27-11 et seq. provides that a Contractor commits a crime if said person, directly or indirectly, confers or agrees to confer any benefit not allowed by law to a public servant.

Contractors should consult the statutes, regulations, and/or legal counsel for further information.

3.2. NOTICE OF AWARD AND EXECUTION OF CONTRACT

A. Award, if made, will be to the lowest responsible, responsive bidder. In such case where alternate bids will be considered, the low bidder will be determined based on the combined amount of the base bid plus the alternate bid, or bids in the order such alternates are listed on the Bid Proposed Form, which will be included in the contract awarded.

B. The Bidder to whom the contract is awarded shall be required to execute said Contract and obtain the Payment and Performance Bond and within twenty-one (21) days from the date when the Notice of Award of Contract is delivered to the Contractor.

C. The Authority, within seven (7) days of receipt of the Agreement signed by the Successful Bidder awarded the bid, shall sign the Contract and return to the Successful Bidder the executed duplicate of the Agreement.

D. Failure to deliver the documents as specified in the award shall be cause for the Authority to declare the Bidder non-responsive and to, at the Authority's discretion, award the Contract to the next lowest responsible Bidder.

E. The Notice to Proceed shall be issued within seven (7) days of the execution of the Performance Bond, Payment Bond and Agreement by the Authority. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the Authority and Successful Bidder.

3.3. RESPONSIBLE CONTRACTORS

The Cumberland County Improvement Authority shall determine whether a Bidder is "responsible" as defined in N.J.S.A. 40A:11-2(32). The Bid Proposal of any Bidder that is deemed not to be "responsible" shall be rejected in accordance with applicable law.

3.4. PERFORMANCE BOND

A. For the duration of the term of the Contract the successful Bidder shall provide a performance bond issued by a Surety in an amount equal to no more than one hundred percent (100%) of the value of the Contract. The successful Bidder shall provide said performance bond concurrent with the delivery of the executed Contract to the Purchasing Agent at the address indicated in the advertisement.

B. Failure to deliver the performance bond at the time and place specified by the Cumberland County Improvement Authority shall be cause for the assessment of damages in an amount equal to the amount of the bid guarantee. In addition, the Authority may award the Contract to the next lowest responsible Bidder or terminate the bid process and rebid the project.

3.5. AFFIRMATIVE ACTION REQUIREMENTS

A. If awarded a contract; the successful Bidder will be required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

B. For Maintenance/Construction Contracts, after notification of award, but prior to signing the contract, the Successful Bidder shall submit to the public agency compliance officer and the Department of Labor and Workforce Development, Construction EEO Compliance Monitoring Program an Initial Project Workforce Report (Form AA-201) in accordance with N.J.A.C. 17:27-7.

The Successful Bidder shall also submit a copy of the Monthly Project Workforce Report (Form AA-202) once a month thereafter for the duration of the contract to the Department of Labor & Workforce Development, Construction EEO Compliance Monitoring Program and to the public agency compliance officer. The Successful Bidder shall also cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job programs for outreach and training of minorities and women.

C. Failure to submit the pre-award affirmative action documents by the time set forth above shall preclude the award of a contract to the Bidder and allow the Authority, at its discretion, to award the Contract to the next lowest responsible Bidder.

4. GENERAL REQUIREMENTS

4.1. FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

The Bidder guarantees that all materials, supplies and equipment as listed on any bid, request for proposal, quotation, contract or purchase order, furnished or delivered to the Authority meet the requirements, specifications and standards as provided for under the Federal Occupational Safety and Health Act of 1970, as amended from time to time and enforced as of the date hereof.

4.2. SAFETY STANDARDS

The Bidders should be aware, if awarded the Contract that they will be responsible for any and all subcontractors, as well as themselves, that they are required to comply with all applicable local, state and federal safety, health and environmental regulations, including provisions for protecting the Authority's employees and the public from construction hazards.

The Authority retains the right to have its safety representatives inspect any construction project taking place on the owner's property or through the owner's auspices. The Authority reserves the right to stop work if an imminent hazard exists. The costs, if any, created by a work stoppage due to unsafe conditions, will be borne by the contractor responsible for the unsafe condition.

4.3. AMERICANS WITH DISABILITIES ACT OF 1990

Discrimination on the basis of disability in contracting for the purchase of goods and services is prohibited. Contractors are required to read Americans With Disabilities language that is included as Appendix B of this specification and agree that the provisions of Title II of the Act are made a part of the contract. The Bidder is obligated to comply with the Act and to hold the owner harmless.

4.4. OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 provides that no corporation, partnership or limited liability company shall be awarded any contract for the performance of any work or the furnishing of any goods and services, 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 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. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent 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 noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed. This requirement applies to all forms of corporations, partnerships and limited liability companies, including, but not limited to, limited partnerships, limited liability corporations limited liability partnerships and Subchapter S corporations. 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

10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest. Failure to submit an ownership disclosure document shall result in rejection of the bid.

4.5. PROOF OF BUSINESS REGISTRATION

N.J.S.A 52:32-44 requires that each Bidder submit proof of business registration prior to the time a contract is awarded or authorized. Proof of registration shall be a copy of the Bidder's Business Registration Certificate (BRC). A BRC is obtained from the NJ Division of Revenue. Information on obtaining a BRC is available on the internet at www.nj.gov/njbgs or by phone at (609) 292-1730. N.J.S.A. 52:32-44 imposes requirements on contractors and all subcontractors that **knowingly** provide goods or perform services for a contractor fulfilling this contract:

Prior to receipt of final payment from a contracting agency, a contractor must submit to the contracting agency an accurate list of all subcontractors or attest that none was used;

In accordance with N.J.S.A. 54:49-4.1, any contractor, subcontractor or supplier that fails to provide proof of business registration information or that provides false information of business registration shall be liable to a penalty of $25 for each day of violation, not to exceed $50,000 for each business registration not properly provided or maintained under a contract with a contracting agency. Information on the law and its requirements is available by calling (609) 292-9292.

4.6. NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT

The manufacturer or supplier of chemical substances or mixtures shall label them in accordance with the NJ Worker and Community Right to Know Act and its regulations (N.J.S.A. 34:5A-1 et seq., and N.J.A.C. 8:59). Containers that the law and rules require to be labeled shall show the Chemical Abstracts Service number of all the components and the chemical name. Further, all applicable Material Safety Data Sheets (MSDS) - hazardous substance fact sheet - must be furnished.

4.7. PREVAILING WAGE ACT

1. Pursuant to N.J.S.A 34:11-56.25 et seq., contractors on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. Workers shall be paid not less than such prevailing wage rate and in the event it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, the public body, the lessee to whom the public body is leasing a property or premises or the lessor from whom the public body is leasing or will be leasing a property or premises may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor shall be required to submit a certified payroll record to the owner within ten (10) days of the payment of wages. The Contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. The contractor shall submit said certified payrolls in the form set forth in N.J.A.C. 12:60-

5.I(C). It is the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards, additional information is available at www.state.nj.us/labor/lsse/lspubcon.htmi.

4.8. PUBLIC WORKS CONTRACTOR REGISTRATION ACT

N.J.S.A. 34:1 1-56.48 et seq. requires that a general or prime contractor and any listed subcontractors named in the contractor's bid proposal shall possess a certificate at the time the bid proposal is submitted. After bid proposals are received and prior to award of contract, the successful contractor shall submit a copy of the contractor's certification along with those of all listed subcontractors. All non-listed subcontractors and lower tier sub-contractors shall be registered prior to starting work on the project. It is the general contractor's responsibility that all non-listed sub-contractors at any tier have their certificate prior to starting work on the job.

Under the law a "contractor" is "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 provisions of the New Jersey Prevailing Wage Act (N.J.S.A. 34:11-56.25, et seq.). It applies to contractors based in New Jersey or in another state and to subcontractors or lower tier subcontractors of a contractor.

The law defines "public works" as:

- "Construction, reconstruction, demolition, alteration, or repair work, or maintenance work, including painting and decorating, done under contract and paid for in whole or in part out of the funds of a public body, except work performed under a rehabilitation program.
- "Public Work" shall also mean construction, reconstruction, demolition, alteration, or repair work, done on any property or premises, whether or not the work is paid for from public funds".

- "Maintenance Work" means the repair of existing facilities when the size, type or extent of such facilities is not thereby changed or increased. While "maintenance" includes painting and decorating and is covered under the law, it does not include work such as routine landscape maintenance or janitorial services.

To register, a contractor must provide the State Department of Labor and Workforce Development with a full and accurately completed application form.

N.J.S.A.34:11-56.55 specifically prohibits accepting applications for registration as a substitute for a certificate of registration.

4.10. PRICING INFORMATION FOR PREPARATION OF BIDS

A. The Authority is exempt from any local, state, or federal sales, use or excise tax.

B. Successful Bidder shall be responsible for obtaining any applicable permits or licenses from any government entity that has jurisdiction to require the same. The cost of all permits will be paid for by the Authority.

C. Bidders shall insert prices for furnishing goods and services required by these specifications. Prices shall be net, including any charges for packing, crating, containers, etc. All transportation charges shall be fully prepaid by the contractor, F.O.B. destination and placement at locations specified by the owner. As specified, placement may require inside deliveries. No additional charges will be allowed for any transportation costs resulting from partial shipments made for the contractor's convenience.

4.11. CERTIFICATES

Upon notification by the Cumberland County Improvement Authority, the lowest responsible Bidder shall supply to the Contract Administrator, within five days of notification, a certificate of insurance as proof that the insurance policies required by these specifications are in full force and effect.

4.12. INDEMNIFICATION

A. The Successful Bidder agrees to indemnify, save harmless and defend the Cumberland County Improvement Authority and its consultants, elected and appointed officials, representatives, employees and agents (hereinafter the "Authority Indemnified Parties") from and against any and all liabilities, claims, penalties, forfeitures, suits and the costs and expenses incidental thereto (including costs of defense, settlement and reasonable attorney's fees), which the Authority Indemnified Parties may hereafter incur, become responsible for, or pay out as a result of death or bodily injuries to any person, destruction or damage to any property, contamination of or adverse effects on the environment, or any violation of governmental laws, regulations or orders caused, in whole or in part, by the Successful Bidder's performance or failure to perform its obligations under the provisions of this Bid Specification or by any negligent or willful act or omission of the Successful Bidder, its employees, agents, or subcontractor(s) in the performance of this Contract.

4.13. VIOLATIONS OF CONTRACT SPECIFICATIONS

Notwithstanding any specifically enumerated remedy or right the Authority may have for any violation of the terms of the Contract or these Specifications, the Authority reserves the right to pursue any remedies available to it in law or equity for any breach of the terms and conditions contained herein. Any failure of the Authority to enforce the terms and conditions contained herein shall not be deemed a waiver by the Authority of a full enforcement thereof.

4.14. SEVERABILITY

The Contract between the Successful Bidder and the Cumberland County Improvement Authority shall provide that the laws of the State of New Jersey shall govern the agreement. Should a court of competent jurisdiction find that a provision of the agreement is in whole or in part invalid or unenforceable, such finding shall not void or render unenforceable the remainder of the provision or the agreement. This applies, but is

not limited to the agreed upon costs and liquidated damages provisions. In the event that a specified liquidated damage amount is found to be inapplicable, damages may still be calculated as allowed by law.

4.15. TERMINATION OF CONTRACT

A. If, through any cause, the Successful Bidder shall fail to fulfill, in a timely and proper manner, obligations under the contract or if the contractor shall violate any of the requirements of the contract, the owner shall there upon have the right to terminate the contract by giving written notice to the contractor of such termination and specifying the effective date of termination. Such termination shall relieve the owner of any obligation for balances to the contractor of any sum or sums set forth in the contract. Owner will pay only for goods and *services* accepted prior to termination.

B. Notwithstanding the above, the Successful Bidder shall not be relieved of liability to the Authority for damages sustained by the owner by virtue of any breach of the contract by the contractor and the owner may withhold any payments to the contractor for the purpose of compensation until such time as the exact amount of the damage due the owner from the contractor is determined.

C. The Successful Bidder agrees to indemnify and hold the owner harmless from any liability to subcontractors and/or suppliers concerning payment for work performed or goods supplied arising out of the lawful termination of the contract by the owner under this provision.

D. In case of default by the Successful Bidder, the owner may procure the goods or services from other sources and hold the contractor responsible for any compensatory damages.

4.16 PAYMENT

A. No payment will be made unless duly authorized by the Owner's authorized representative and accompanied by proper documentation.

B. Successful Bidder shall be paid in accordance with the Contract upon receipt of an invoice and properly executed voucher. After approval by the Authority, the payment voucher shall be placed in line for prompt payment in accordance with the Prompt Payment Act, NJSA 2A:30A-1 et seq. Each invoice shall contain an itemized, detailed description of all work performed during the billing period. Failure to provide sufficient specificity shall be cause for rejection of the invoice until the necessary details are provided. It is also agreed and understood that the acceptance of the final payment by the Successful Bidder shall be considered a release in full of all claims against the Authority arising out of, or by reason of, the work done and materials furnished under the contract.

C. The payment cycle (as per N.J.S.A. 2A:30A-2a) shall be:

1. If the contractor has performed in accordance with the contract; and
2. The work has been approved and certified by the owner or the owner's authorized agent.
3. The owner shall pay the bill not more than 30 calendar days after the billing date.

4. Provided that the billing shall be deemed "approved" and "certified" 20 calendar days after the owner receives it, unless the owner provides, before the end of the 20 day period, a written statement of the amount withheld and reason for withholding payment.
5. The 20th calendar day deadline of the decision to withhold full or partial payment shall be deferred until the next scheduled public meeting (any public meeting open to the public) following 20 calendar days of the billing date, at which time the bill must be approved for payment or notice provided as to why the bill or any portion thereof will not be approved.
6. If the billing is approved, the bill is required to be paid in the payment cycle following the meeting.

D. The billing date for the final and retainage payments shall be the date the bill is received by the Cumberland County Improvement Authority.

E. Requests for payment that have been approved and certified are approved monthly at the meetings of the CCIA Board of Commissioners. Payment requests to be considered for the previous month's bill must be received, by the first business day of the following month. Meeting Dates can be view on the CCIA webpage: https://www.ccia-net.com/public-information/meetings-resolutions

4.17 MANDATORY CONTRACT DISPUTE PROCEDURES

The Bidder agrees to Mandatory Dispute Procedures required by N.J.S.A. 2A:30A-2(f) and N.J.S.A. 40A:11-50, as described below:

In an effort to resolve any disputes that arise during the construction of the project or following the completion of the project, the Bidder and Owner agree that all disputes between them arising out of or relating to the performance of the work described in the contract documents shall be submitted to non-binding mediation with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the party to the Contract and with the American Arbitration Association.

The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in court having jurisdiction thereof.

The Bidder further agrees to include a similar mediation provision in all agreements with independent contractors and consultants retained for the project and to require all independent contractors and consultants also to include a similar mediation provision in all agreements with subcontractors, sub-consultants, suppliers or fabricators so retained, thereby providing for mediation as the primary method for dispute resolutions between the parties to those agreements.

Nothing in this section shall prevent the Owner from seeking injunctive or declaratory relief in court or at any time. The alternative dispute resolution practices required by this section shall not apply to disputes concerning the bid solicitation or award process, or the formation of contracts or subcontracts to be entered into pursuant to P.L. 1971, c.198 (C:40A:11-1, et seq.).

4.18. ACCESS TO RELEVANT DOCUMENTS AND INFORMATION—N.J.S.A. 52:15C-14 (d)

Private contractors or other persons contracting with or receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State authority, public institution of higher education, or unit of local government or board of education shall upon request by the Office of the State Comptroller (OSC) provide the State Comptroller with prompt access to all relevant documents and information as a condition of the contract and receipt of public monies. The State Comptroller shall not disclose any document or information to which access is provided that is confidential or proprietary. If the State Comptroller finds that any person receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State authority, public institution of higher education, or unit of local government or board of education refuses to provide information upon the request of the State Comptroller, or otherwise impedes or fails to cooperate with any audit or performance review, the State Comptroller may recommend to the contracting unit that the person be subject to termination of their contract, or temporarily or permanently debarred from contracting with the contracting unit.

Relevant records of private Contractors or other persons entering into contracts with covered entities are subject to audit or review by OSC pursuant to N.J.S.A. 52:15C-14(d). The contractor/vendor to whom a contract has been awarded, shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

A1

A. BID FORMS

BID DOCUMENT CHECKLIST

Initial	Bid Documents	Form Number
	1. Bid Forms	
	Bid Document Checklist	A1
	Bid Proposal Form	A2
	List of Subcontractors	A3
	Construction Bids Subcontractors List Instructions	A4
	Acknowledgment of Receipt of Addenda	A5
	Consent of Surety Form	A6
	2. Qualifications	
	Certification of Bidder's Qualifications	B1
	Debarred, Suspended and Disqualified Bidder Statement for Prime Contractor and All Listed Subcontractors	B2
	Certification of NJ Business Registration for Prime Contractor and All Listed Subcontractors	B3
	3. Additional Requirements	
	Certification of Non-segregated Facilities	C1
	Disclosure of Contributions to NJ Election Law Enforcement Commission - Affidavit	C2
	Disclosure of Investment Activity in Iran	C3
	Non-Collusion Affidavit	C4
	Equipment Certification	C5
	Ownership Disclosure Certification	C6
	Americans With Disabilities Act of 1990	C7
	Mandatory Equal Employment Opportunity Language	C8

A2

BID PROPOSAL FORM

Renovations to:
Engineering Lab

for the
Cumberland County Improvement Authority
745 Lebanon Road
Millville, New Jersey, 08332

_____

(Contract Title and Bid Number, if applicable)

General and Complete Construction Services, material, equipment, labor, oversite, and administration for a complete and operable, Renovations for New Engineering Lab, at the Cumberland County College, 3322 College Drive, Vineland, NJ 08360.

Renovations to: Engineering Lab

(Description of goods/services being bid)

The undersigned proposes to furnish and deliver the above goods/services in accordance with the Contract Documents including the following:

1. Cumberland County Improvement Authority AIA Document 101 and AIA Document 201.
2. Technical specifications and drawings prepared by Manders Merighi Portadin Farrell Architects.
3. All associated project exhibits and addenda.

_____ _____

Company Name **Federal I.D. # or Social Security #**

_____

Address

_____ _____

Telephone Number **Date**

_____

E-mail Address

BID AMOUNT:

BASE BID:

The Base Bid Amount, which shall include all General and Complete Construction Services, material, equipment, labor, oversite, and administration for a complete and operable Renovations to: Engineering Lab, as shown on the Drawings and described in the Specifications, and to coordinate our work with that of all other contractors employed by the Owner. All work and material shall be as required by and in strict conformance with the Contract Documents and Addenda thereto, covering the execution of the work within the limit of the Contract, for the base bid sum of:

$ _____

_____

(Above Written in Words)

ALLOWANCES:

General Allowance – amount provided below.

TOTAL LUMP SUM BID AMOUNT:

Base Bid (from above):		$ _____
Allowance	+	$ 20,000.00
Total Lump Sum Bid Amount (base bid plus allowance)		$ _____

_____

(Above Written in Words)

ALTERNATE BIDS:

ADD ALTERNATE #1: The Add Alternate Bid Amount, which shall include the 'added cost only' for all General and Complete Construction Services, material, equipment, labor, oversite, and administration for a complete and operable summary of Add Alt #1. Alternate #1 includes but is not limited to selective demolition work in areas indicated on the Drawings. All work and material shall be as required by and in strict conformance with the Contract Documents and Addenda thereto, covering the execution of the work within the limit of the Contract, for the bid sum of:

$_____

_____

(Above Written in Words)

ADD ALTERNATE #2: The Add Alternate Bid Amount, which shall include the 'added cost only' for all General and Complete Construction Services, material, equipment, labor, oversite, and administration for a complete and operable summary of Add Alt #2. Alternate #2 includes but is not limited to selective demolition and the construction of a Computer Lab and the extension of a corridor. All work required is as indicated on the Drawings. All work and material shall be as required by and in strict conformance with the Contract Documents and Addenda thereto, covering the execution of the work within the limit of the Contract, for the bid sum of:

$_____

_____

(Above Written in Words)

ADD ALTERNATE #3: The Add Alternate Bid Amount, which shall include the 'added cost only' for all General and Complete Construction Services, material, equipment, labor, oversite, and administration for a complete and operable summary of Add Alt #3. Alternate #3 includes but is not limited to the selective demolition and the construction of Engineering Lab #2 and the Drone Zone. All work required is as indicated on the Drawings. All work and material shall be as required by and in strict conformance with the Contract Documents and Addenda thereto, covering the execution of the work within the limit of the Contract, for the bid sum of:

$_____

_____

(Above Written in Words)

LIST OF SUBCONTRACTORS

A3

The Bidder certifies that the following subcontracting firms and/or businesses will be awarded subcontracts for the portions of the work listed below, in the event that the Contractor is awarded the Contract. The Bidder further certifies that except as otherwise provided herein, it shall not use subcontracts if no subcontractors are listed below:

SECTION I. SUBCONTRACTORS REQUIRED TO BE NAMED PURSUANT TO N.J.S.A.40A:11-16:

Trade Subcontracted: Structural Steel

Subcontractor: _____

Address: _____

Trade Subcontracted: Plumbing

Subcontractor: _____ License #: _____

Address: _____

Note: To comply with N.J.S.A.45:14C-2(h), a master plumber must own at least 10% of the named plumbing subcontractor. Identify below the licensed master plumber, who shall be compliant with N.J.S.A. 45:14C-(2)h):

Name of Plumber: _____ License Number: _____

Trade Subcontracted: HVAC

Subcontractor: _____ License #: _____

Address: _____

Trade Subcontracted: Electrical

Subcontractor: _____ License #: _____

Address: _____

_____
NAME OF BIDDER

_____
SIGNATURE OF AUTHORIZED REPRESENTATIVE

_____
PRINT NAME AND TITLE OF SIGNATORY

_____
DATE

A4

CONSTRUCTION BIDS
SUBCONTRACTOR LIST
INSTRUCTIONS

Failure to complete any certification and include it with your bid package shall result in your bid being deemed incomplete pursuant to N.J.S.A. 40A: 11-16.

If you plan to use in-house employees for any trade then you must include, with your bid, the name of the license holder for this trade and a copy of his/her license.

PROCEDURE FOR CHANGE IN SUBCONTRACTORS AFTER AN AWARD IS MADE

Construction contracts using subcontractors may only use those they listed in the bid package. Should the need arise to change subcontractors, the following rules must be adhered to prior to making any changes.

1. The request for a change of subcontractors must be in writing and submitted to the contact person, along with copies of agreements between the general contractor and his existing subcontractor and the proposed agreement with the replacement contractor.
2. The reason for the change in subcontractors must be presented in the request to change subcontractors. The request must also note any potential savings or additional costs that may be derived as a result of the change.
3. This request will be reviewed by the CCIA Construction Manager, Executive Director and CCIA Counsel.
4. The general contractor will be notified in writing with the result of the findings of the request.

A5

ACKNOWLEDGMENT OF RECEIPT OF ADDENDA

The undersigned Contractor hereby acknowledges receipt of the following Addenda:

Addendum Number	Dated	Acknowledge Receipt (initial)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

□ **No addenda were received**:

Acknowledged for: _____
(Name of Contractor)

By: _____
(Signature of Authorized Representative)

Name: _____
(Print or Type)

Title: _____

Date: _____

CONSENT OF SURETY A6

A performance bond will be required from the successful contractor on this project, and consequently, all Contractors shall submit, with their bid, a consent of surety in substantially the following form:

To: _____
(Authority)

Re: _____
(Contractor)

_____
(Project Description)

This is to certify that the _____
(Surety Company)

will provide to _____ a performance bond in
(Authority)
the full amount of awarded contract in the event that said contractor is awarded a contract for the above project.

_____
(CONTRACTOR)

_____
(Authorized Agent of Surety Company)

Date:_____

CONSENT OF SURETY MUST BE SIGNED BY AN AUTHORIZED AGENT OR REPRESENTATIVE OF A SURETY COMPANY AND NOT BY THE INDIVIDUAL OR COMPANY REPRESENTATIVE SUBMITTING THE BID.

CERTIFICATION OF BIDDER'S QUALIFICATIONS
FOR PRIME CONTRACTOR AND CURRENT CONTRACT STATUS B1

I, the undersigned, certify and warrant as follows:

I. That the Bidder is financially solvent and is experienced in and competent to perform the type of work and to furnish the labor, materials, supplies and equipment to be so performed or furnished by the Bidder; and,

II. That the Bidder is familiar with all federal, state and municipal laws, ordinances and regulations of any agency which may in any way affect the work of those employed therein, including but not limited to any special acts relating to the work or to the project of which it is a part; and,

III. That such temporary and permanent work as may be required by the Specifications and Contract Documents or other contracts as is to be done by the Bidder can be satisfactorily constructed and used for the purpose for which it is intended, and that such construction will not injure any person or damage any property; and,

IV. The Bidder has been organized to do business under the present business name since _____.
(insert date)

The Bidder was incorporated effective _____.
(insert date)

The Bidder has experience performing work and services of the nature required by the above referenced Contract since _____.
(insert date)

V. The following is a list of similar work or services which the Bidder has completed in the last five (5) years together with the name and address of the owner and the contract price:

Location of project:
_____

Description of project:
_____

Year: _____Contract Price: _____

Name of Owner: _____

Contact Name: _____

Address: _____

Telephone: _____

Location of project:

_____

Description of project:

_____

Year: _____Contract Price: _____

Name of Owner: _____

Contact Name: _____

Address: _____

Telephone: _____

.....

Location of project:

_____

Description of project:

_____

Year: _____Contract Price: _____

Name of Owner: _____

Contact Name: _____

Address: _____

Telephone: _____

Location of project:

_____

Description of project:

_____

Year: _____Contract Price: _____

Name of Owner: _____

Contact Name: _____

Address: _____

Telephone: _____

VI. The following is a list of all projects currently being worked on by the Bidder and the Contract completion date for the each referenced Contract:

Project Location and Owner	Brief Description	Contract Amount	Contract Completion Date

(Use blank sheet(s) if additional space is needed)

VII. The following is a list of References which may be contacted to substantiate the Bidder's qualifications (Name only the engineers, owners or representatives, including public agencies, for whom the Bidder has performed work):

Name	Address	Engineer, Owner or Agency

VIII. The following is a list of Banks and Financial Institutions which can substantiate the financial responsibility of the Bidder.

Name	Address	Representative

IX. The Bidder hereby certifies that he/she currently holds any and all applicable licenses to perform the work and services designated above for the Project, and evidence of said licenses is attached hereto.

DEBARRED, SUSPENDED AND DISQUALIFIED BIDDER STATEMENT
FOR PRIME CONTRACTOR AND ALL LISTED SUBCONTRACTORS

B2

I, the undersigned solemnly swear and affirm that

_____
(Name of Contractor)

is/was not included on the New Jersey State Treasurer's List of Debarred, Suspended, or Disqualified Bidders at the time of the Bid submission. Furthermore, I agree to immediately notify the Cumberland County Improvement Authority wherever it appears that

_____
(Name of Contractor)

is found to be on the aforementioned New Jersey State Treasurer's List.

_____
NAME OF BIDDER

_____
SIGNATURE OF AUTHORIZED REPRESENTATIVE

_____
PRINT NAME AND TITLE OF SIGNATORY

_____
DATE

B3

CERTIFICATION OF NEW JERSEY BUSINESS REGISTRATION
FOR PRIME CONTRACTOR AND ALL LISTED SUBCONTRACTORS

Pursuant to the requirements of New Jersey Business Registration Statute (N.J.S.A. 52:32-44), I hereby certify that the below named Subcontractor holds or shall hold at the time of award of the Contract a valid Business Registration Certificate, and, as proof thereof, a copy of said Business Registration Certificate shall be provided at the time of award.

_____
NAME OF SUBCONTRACTOR

_____
SIGNATURE OF AUTHORIZED REPRESENTATIVE

_____
PRINT NAME AND TITLE OF SIGNATORY

_____
DATE

CERTIFICATION OF NON-SEGREGATED FACILITIES C1

THE UNDERSIGNED CERTIFIES that he/she does not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location under his/her control where segregated facilities are maintained. He/she certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she will not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Opportunity clause in this Contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and other storage or dressing areas, transportation, and housing facilities, recreation or entertaining areas, parking lots, drinking fountains provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise.

THE UNDERSIGNED FURTHER AGREES that except where he has obtained identical certifications from proposed subcontractors for specific time periods he/she will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000.00 which are not exempt from the provisions of the Equal Opportunity clause; that he/she will retain such certifications in his/her files; and that he/she will forward a notice to his/her proposed subcontractors as provided in the Instructions to Bidders.

_____
Signature

_____, 20__

_____
Title

Subscribed and sworn to before me

This _____ day of _____, 20__

_____
Signature

My commission expires
_____, 20__

C2

DISCLOSURE OF CONTRIBUTIONS TO NEW JERSEY ELECTION LAW ENFORCEMENT COMMISSION AFFIDAVIT IN ACCORDANCE WITH N.J.S.A. 19:44A-20.27

STATE OF)
ss:
COUNTY OF)

I, _____, of full age, being duly sworn according to
(Name)

law, on my oath depose and say that I am

_____
(Title, Position, etc.)

of the firm of

_____

the Bidder, making the Bid for the following project:

_____

_____

that I executed the said Proposal with full authority to do so; that said Bidder acknowledges our responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to *N.J.S.A.* 19:44A-20.27 if in receipt of contracts in excess of $50,000.00 from public entities in a calendar year. I further acknowledge that business entities are solely responsible for determining if filing is necessary and that all statements contained in said Proposal and in this Affidavit are true and correct, and made with full knowledge that the Cumberland County Improvement Authority relies upon the truth of the statements contained in said Proposal and in the statements contained in this Affidavit in awarding the Contract for said project.

_____
(Signature)

_____
(Type of print name of affiant)

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

_____ [SEAL]

Notary Public, State of _____

My commission expires _____

C3

DISCLOSURE OF INVESTMENT ACTIVITY IN IRAN

Proposer:_____

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 the person or entity, or one of the person or entity's parents, subsidiaries, or affiliates, is not identified on a list created and maintained by the New Jersey Department of the Treasury ("Treasury") as a person or entity engaging in investment activities in Iran. If the Director finds a person or entity to be in violation of the Act or of the principles which are the subject of this 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 person or entity.

I certify, pursuant to Public Law 2012, c.25, that the person or entity listed above for which I am authorized to submit a proposal:

Is not providing goods or services of $20,000.00 or more in the energy sector of Iran, including a person or entity that provides oil or liquified natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquified natural gas, for the energy sector of Iran.

AND

Is not a financial institution that extends $20,000.00 or more in credit to another person or entity, for 45 days or more, if that person or entity will use the credit to provide goods or services in the energy sector of Iran.
In the event that a person or entity is unable to make the above certification because it or one of its parents, subsidiaries, or affiliates has engaged in the above-referenced activities, a detailed, accurate and precise description of the activities must be provided in Part 2 below to Cumberland County Improvement Authority under penalty of perjury. Failure to provide such will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the proposer, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the information below.

Name:_____ Relationship to Proposer:_____

Description of Activities:_____

Duration of Engagement: _____ Anticipated Cessation Date:_____
Proposer Contact Name:_____ Contact Phone Number:_____

Certification: I being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto, are true and complete to the best of my knowledge. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the State of New Jersey is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State to notify the State in writing of any changes to the answers of information contained herein. I acknowledge 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 recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the State of New Jersey and that the State at it option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):_____ Signature:_____

Title:_____ Date:_____

NON-COLLUSION AFFIDAVIT C4

State of New Jersey
County of _____ ss:

I, _____ residing in _____
(name of affiant) (name of municipality)
in the County of _____ and State of _____of full age, being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____
(title or position) (name of firm)

_____ the Contractor making this Proposal for the bid

entitled _____, and that I executed the said proposal with
(title of bid proposal)
full authority to do so that said Contractor has not, directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said proposal and in this affidavit are true and correct, and made with full knowledge that the _____ _____relies upon the truth of the statements contained in said Proposal
(name of contracting unit)
and in the statements contained in this affidavit in awarding the contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by _____.

Subscribed and sworn to

before me this day _____
Signature

_____, 2____ _____
(Type or print name of affiant under signature)

_____
Notary public of

My Commission expires _____

(Seal)

EQUIPMENT CERTIFICATION

The undersigned Contractor hereby certifies as follows:

The Contractor owns or controls all the necessary equipment required to accomplish the work described in the specifications.

Name of Contractor: _____

By: _____
(Signature)

Name of above: _____
(Print)

Title: _____

Date:_____

C6

OWNERSHIP DISCLOSURE CERTIFICATION
This Certification Shall Be Included with Bid Submission

Name of Business _____

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 cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, 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 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. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent 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 noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

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 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest.

□ I certify that the list below contains the names and addresses of all individual partners, members or stockholders owning or holding a 10% or more in the partnership or limited liability company, or of the issued and outstanding stock of the undersigned.

OR

□ I certify that no one individual partner, member or stockholder owns 10% or more in the partnership or limited liability company or of the issued and outstanding stock of the undersigned.

Check the box that represents the type of business organization:

□ Partnership
□ Corporation □ Sole Proprietorship
□ Limited Partnership □ Limited Liability Corporation □ Limited Liability Partnership
□ Subchapter S Corporation

Sign and notarize the form below, and, if necessary, complete the list below.

_____

Partners, Members or Stockholders:

Name: _____ Name: _____

Home Address: _____ Home Address: _____

_____ _____

Name: _____ Name: _____

Home Address: _____ Home Address: _____

_____ _____

Name: _____ Name: _____

Home Address: _____ Home Address: _____

_____ _____

this disclosure is to be extended to all tiers of ownership, additional pages shall be added as necessary until disclosure as required by law is complete.

Subscribed and sworn before me this _____ day of

_____ , 20 ____.

_____
(Affiant)

_____
(Print name & title of affiant)

(Notary Public)

My Commission expires:

(Seal)

C7

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The contractor and the Cumberland County Improvement Authority, (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. S121 01* 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 there unto, 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 that 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 other 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 the Agreement or otherwise at law.

C8

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, upgrading, 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 con-tractor 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 bar-gaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

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

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. l7:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures pre-scribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, 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 sub-contractor 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 sub-contractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

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

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

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

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

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

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

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:
(i) The contactor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in

conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the con-tractor 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 Dept. of LWD, Construction EEO Monitoring Program, 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 Dept. of LWD, Construction EEO Monitoring Program.

(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 Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program 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 apprentice-ship 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 Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its web-site, 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 Dept. of LWD, Construction EEO Monitoring Program, 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 Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be re-quested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

SECTION 01 11 00 - SUMMARY OF WORK (SINGLE PRIME CONTRACT) AND GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Sections, apply to work of this Section.

1.2 PROJECT DESCRIPTION

A. The Project consists of renovations at the MILL Building, at Cumberland County College, for a New Engineering Lab facility.

B. The extent of the contract work is indicated in the Contract Documents.

1. The Work shall be Prevailing Wage.
2. The Work includes, but is not limited to demolition, renovations and new construction.

C. The Contractor shall employ his workers for overtime work if required to meet the completion dates, at no additional cost to the Owner.

D. The scope of the work shall not be limited to what is specifically called out on the drawings or specifications, but shall include any and all selective demolition as well as any cutting and patching as may be required to accomplish the intended construction.

1.3 USE OF PREMISES

A. The Contractor shall limit his use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public.

1. Confine operations to areas within contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

B. Maintain the existing building in a weather tight condition throughout the construction period. Repair damage caused by constructions operations. Take all precautions necessary to protect the building and its occupants during the construction period.

C. Parking: Contractor's employees' cars shall be parked in a location approved by the Owner of the site. All local parking regulations will be adhered to.

1.4 KNOWLEDGE OF CONTRACT REQUIREMENTS

A. The Contractor and his Subcontractor's, Sub-Subcontractor's and material men shall consult in detail the General Conditions, Supplementary Conditions, all Divisions and Sections of the Specifications, all Drawings and all Addenda for instructions and requirements pertaining to the Work, and at his and their cost, shall provide all labor, materials, equipment and services necessary to furnish, install and complete the work in strict conformance with all provisions thereof.

B. The Scope of Work for the Contract is not necessarily limited to the description of each Section of the Specifications and the illustrations shown on the Drawings. Include all minor items not expressly indicated in the Contract Documents, or as might be found necessary as a result of field conditions, in order to complete the work as it is intended, without any gaps between the various subdivisions of work of the Contractor and his Subcontractors.

C. The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the neighborhood of the project including, but not limited to, Unions, incentive pay, procurement, living and commuting conditions and to have informed his Subcontractors and Sub-Subcontractors thereof.

1.5 JOB SITE CONDITIONS

A. Prior to ordering material or undertaking any work, the Contractor shall verify all measurements & elevations at the site. No extra compensation will be allowed because of difference between actual measurements of existing conditions and dimensions shown, but such difference shall be referred to the Architect/Engineer for consideration before proceeding with the work.

B. Contractor, as part of his responsibilities, shall take every reasonable precaution to protect the work and to avoid delay from issues arising from weather related events.

C. Protect all materials for ongoing and completed work from rain, snow, ice, and cold or hot weather conditions. Cover soil stockpiles with plastic sheeting. Use insulated blankets or other means when necessary to protect the work or to maintain progress of the work. Cover staged materials, and raise off the ground as appropriate, or store in appropriate storage units.

D. Contractor shall be responsible to remove rain, snow, ice or other weather-related impacts from the work area to avoid delay and continue progress of the work. All work must be protected from water infiltration by covering or diversion in the case of site excavation and grading work. Trenches and other excavated areas shall be protected by temporary grading or other means of diversion, or removal, to avoid filling the open work areas with rain water or water from any other source. Contractor is responsible to remove water, snow, ice and other weather-related issues promptly and by whatever means to allow continued progress of the work.

E. Water trucks or other means will be utilized, at no additional cost, to control the dust as an ongoing project requirement until permanent cover is in place and no further dust is generated. (if due to the Contractor's lack of adequate precautions, neighboring properties are damaged, as result of dust, dirt or other site-related contaminant, then the Contractor shall be responsible to correct such damage at no additional cost)

F. Tree and Plant Protection:

1. No existing vegetation shall be cut, pruned, tied or removed unless and until the approval of the Owner is obtained. The contractors shall be held responsible for any such damage as a result of his contract. The Architect or Owner shall determine responsibility for plant damage, and therefore who shall replace or restore the damaged tree or shrub. Lawns damaged by construction activities shall be repaired with sod, and established by the Contractor before turning over to the owner.
2. It is the Owner's intent that existing trees, scheduled to remain, be carefully protected in the area of construction, and shall be protected and maintained by the General Contractor with a sound fence. Such fence shall be similar to orange snow fence, a minimum of 4' high, and shall be supported with metal rebar rods spaced no further than 6' on center.

1.6 CONTRACT DOCUMENTS INFORMATION

A. The Contract Documents are prepared in accordance with available information as to existing conditions and locations. If, during construction, conditions are revealed at variance with the Contract Documents, notify the Architect promptly so that supplementary instructions may be issued.

B. The Specifications determine the kinds and methods of installation of the various materials, the Drawings establish the quantities, dimensions and details of materials, the schedules on the Drawings give the location, type and extent of the materials.

C. Should the Drawings, Specifications or schedules disagree in themselves or with either or both of the others, the better quality or greater quantity of work or materials shall be performed and provided, unless otherwise directed in writing by the Architect.

D. Dimensions given on the Drawings govern scale measurements and large-scale drawings govern small scale drawings, except as to anything omitted unless such omission is expressly noted on the larger scale drawings.

E. The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic/descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.

F. Whenever a material, article or piece of equipment is referred to in the singular number in the Contract Documents, it shall be the same as referring to it in the plural. As many such materials, articles or pieces of equipment shall be provided as are required to complete the work.

G. With the approval of the Architect and without additional cost to the Owner, the Contractor shall make all necessary changes or modifications to locations as may be necessary to suit requirements and conditions at the building and for the proper and conveniently accessible location of all parts of systems within the project.

H. Small details not usually shown or specified, but necessary for the proper installation and operation of the work, shall be provided.

I. Cap all incomplete lines, ducts, conduits, openings, etc., until ready for final connection, after which they shall be thoroughly cleaned and left unobstructed.

1.7 PERMITS, LICENSES, AND CERTIFICATIONS

A. The contractors shall apply for and procure all applicable permits and licenses, and give all notices necessary for the commencement of their work. It shall be the Owner's responsibility to reimburse the Contractor for a local "building" permit (if any). All other permits and contractor registration fees and licenses shall be obtained and paid for by the contractors. The contractors are responsible for contacting The City of Millville to determine all permits, licenses, applications, etc. which are required as part of this project.

1.8 SAFETY

A. The General Contractor is the "Controlling Contractor" on the Project.
General Contractor shall be responsible for Safety on the project and shall follow the standard requirements outlined in OSHA 1926, subpart R as a minimum, and shall conform to the requirements of all Authorities Having Jurisdiction (AHJ). A jobsite specific Safety Plan must be submitted to the Owner's Construction Manager prior to Mobilizing to the project site. This will be considered to be for record purposes only. The Owner's Construction Manager has the right to stop the work at any time if in the Construction Manager's view people or property are in harm's way, This in no way shifts responsibility for Safety to the Construction Manager and the General Contractor remains fully responsible for Safety and is responsible to make any corrections in means or methods required to ensure the safety of the workers and protect the project and or property surrounding the project site. Refer to A 201 Article 10.

B. Underground Facility Protection Act (N.J.S.A. 48-2-73): Per State Law, and in advance any digging or excavation operations, the Contractor must contact New Jersey One Call, at least three full business days (not counting weekends or holidays), prior to beginning work, at 811, or 800-272-1000. The Contractor shall provide proof to the Owner of having met this requirement.
   1. The attention of the bidder is directed to the fact that the contractor is responsible to ascertain the location of any existing utility prior to any excavation work.
   2. No blasting is allowed.

C. Volatile Organic Compounds (VOC): All material used on this Project shall comply with all applicable governmental and local VOC requirements. Contractors shall submit MSDS information for all applicable products, in advance of their use on site. See also Technical Specification Sections for additional information.

1.9 STRUCTURAL OR MEP DEFECTS

A. Contractors shall report to the Architect any structural, mechanical or electrical defects that are exposed or discovered during the course of the work.

B. No corrective work shall take place before a solution is reviewed with the Architect.

1.10 EXPOSED MEP COMPONENTS

A. Any and all mechanical, electrical, and plumbing that is to be exposed in any occupied and/or furnished space shall receive written approval from the Architect prior to its installation. The Architect will further direct the location, attachment method, and finish treatment, that these components require as a result of being approved to be exposed.

B. See also 'Painting' specification for finish requirements of exposed items.

1.11 CONSTRUCTION SCHEDULE

A. The **General Contractor** will be responsible for producing and distributing a comprehensive project schedule, within 2 (two) weeks after the Award of the Project, to the Owner, the Architect, and to all other key Subcontractors. All recipients must review the schedule and incorporate their schedules and/or cmments on the General Contractor's master. A final schedule, revised by the General Contractor, will be derived from this input, and distributed to the parties noted above, no later than 4 (four weeks) after Award of the Project.

B. **The Contractor** shall provide a list of subcontractors, material suppliers and/or installers, and proposed dates for submissions of shop drawings. The list of subcontractors shall be submitted within two weeks of the contract award.

C. A shop drawing schedule will be required of the Contractor, including all applicable trades, to indicate length of delivery time, long lead items, submission date, a reasonable turnaround time, and expected delivery date of the product and approximate date(s) for incorporation into the work.

D. It is anticipated that the Notice to Proceed will be issued on or before Tuesday, May 7, 2019. Construction of all work required under the Base Bid and Add Alternate No. 1 will be completed on or before August 9, 2019. All work required under the Base Bid, Add Alternate No. 1, No. 2 and No. 3 will be completed on or before August 20, 2019

1.12 CLEANING UP

A. Clean up shall receive constant attention, from the start of work through final completion.

B. Clean up shall be performed on a daily basis in the building itself and on the job site overall, including removing project trash blown out onto the local roadways. Public roadways, vehicular pathways, parking areas, pedestrian walkways, and entrance to the project shall be kept clean by power sweeping or other means. Contractor shall clean and sweep the road at the owner's direction when in the Owner's view the road has accumulated debris from the project and is in

an unacceptable condition. The building itself shall be kept broom clean at the end of each day's work shift. Materials shall be stacked neatly and disposed of promptly when no longer needed for the work.

1. Refer to A 201 Article 3.

C. The Contractor shall be responsible for securing and paying for dumpsters and trash bins as required for disposal of demolition and construction debris and general project-related trash.

D. The Contractor shall protect all surfaces, fixtures and equipment in the area of work, from dust and debris. The Contractor shall construct dust barriers as needed to prevent the spread of dirt and dust from areas of work into other areas. As required in the opinion of the Owner, the Contractor shall clean soiled surfaces, fixtures and equipment at the conclusion of the work.

1.13 TEMPORARY UTILITIES

A. Temporary Electricity: If required, the Contractor requiring such utility shall provide means to attach to Owner provided electric source. The Contractor shall be responsible to furnish and maintain wiring and terminations. The Owner will pay for the electricity used in the execution of the work.

B. Temporary Heat:

1. The General Contractor shall supply all necessary temporary heat (and controlled humidity levels), as required to comply with the requirements of all product manufactures for the proper installation and maintenance of their products. The Contractor shall provide, maintain, operate and pay all costs, including fuel, for a sufficient number of approved heaters, so that the progress of the work is not impeded and that the product manufacturer's or recognized standard temperature and moisture requirements are met. Where forbidden by codes and safe construction standards, temporary heating equipment fuels shall not be stored within the "buildings". Adequate temporary heating levels must be maintained as per manufactures requirements, but no temporary heating units can be left unattended while they are within the "buildings" or accessible by residents or students.
2. Should conditions dictate the need, the General Contractor shall provide tenting of work areas for masonry or other weather sensitive work to continue in cold weather. It must be assumed that the new mechanical units will not be used for heat or cooling until the project is complete or areas of the work are accepted by the end user or the use of permanent equipment is approved by the owner's representative.
3. The use of the new heating or HVAC units for temporary heat will not be permitted, unless written approval is provided by the architect and owner. If this approval is granted the equipment will be maintained by the contractor. Filters will be changed on a weekly basis and the warranty for the unit and its components will not start until the completion of the entire project (or the warranty will be extended for a compensatory period of time). All ducts and the unit will be cleaned at the end of the job to the satisfaction of the owner.
4. Final finishes and items such as Millwork and Wood doors, Cabinetry, etc. will commence only after permanent building systems are operational or other means are employed to control temperature and humidity. Installation of any such items prior to permanent building system operation is solely at the Contractor's risk and will be replaced, at the Contractors cost, if damaged in any way due to ambient conditions in the building.

C. Temporary Water: If required, the Contractor requiring such utility shall provide means to attach to Owner provided water source. The Contractor shall be responsible to furnish and maintain hoses and terminations. The Owner will pay for the water used in the execution of the work.

D. Temporary Sanitary Facilities: The Contractor shall provide and maintain toilet facilities of such type as approved by the Architect and the local health authorities, for all the Contractors and others employed on the work, until completion of this Contract (minimum 1). Use of facilities inside campus buildings is prohibited.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION (Not applicable).

END OF SECTION 01 11 00

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SECTION 01 21 00 - 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. Contingency/General allowance.

C. Related Sections:

   1. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
   2. Divisions 02 through 49 Sections (as applicable) for items of Work covered by allowances.

1.3 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 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 margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.6 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

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 contingency allowance of $20,000.00 for use according to Owner's instructions.

END OF SECTION 01 21 00

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SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Alternates.

B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project. Costs for the coordination, modification, or adjustment necessary for each alternate are included in the costs for each Alternate.

D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

E. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.

1. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Includes but is not limited to selective demolition and removal of fish tanks; patching of concrete floor slab in areas of demolition and tank removal.

B. Alternate No. 2: Includes but is not limited to selective demolition; construction of Computer Lab and extension of corridor. and removal of fish tanks; patching of concrete floor slab in areas of demolition and tank removal.

C. Alternate No. 3: Includes but is not limited to selective demolition; construction of Engineering Lab #2 and Drone Zone.

END OF SECTION 01 23 00

SECTION 01 25 00 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Standards: Refer to Section "Reference Standards and Definitions" for applicability of industry standards to products specified.

C. Procedural requirements governing the Contractor's selection of products and product options are included under Section "Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
   1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
   2. Revisions to Contract Documents requested by the Owner or Architect.
   3. Specified options of products and construction methods included in Contract Documents.
   4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received within 40 days after commencement of the Work. Requests received more than 40 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

   1. Submit 3 copies of each request for substitution for consideration. Submit requests in the

form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
   a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
   b. Samples, where applicable or requested.
   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
   d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
   e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
   f. Cost information, including a proposal of the net change, if any in the Contract Sum.
   g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Architect's Action: Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.
   a. The Architect will review each request for substitution only once. The Contractor will be required to reimburse the Architect at his hourly rate, for any reviews which are required, or requested, beyond the initial review.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SUBSTITUTIONS

A. Substitutions may be permitted by the Architect, if, in his opinion, the requirements of the proposed substitution comply with the requirements specified for the material, article or piece of equipment; however, the Architect is not required to permit substitution pursuant to; “Whitten Corporation vs. Paddock, Incorporated,” United States District Court, Massachusetts, April 12, 1974, affirmed by the Federal First Circuit Court, December 14, 1974, and the United States Supreme Court, 1988.

B. The Architect has no obligation, after award of contract, to consider any brand other than those named in the Contract Documents. However, the Contractor may submit substitutes to the Architect for review, fully documented and certified, and accompanied by his proposal for a deduction in the Contract Sum.

C. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.
   a. Extensive revisions to Contract Documents are not required.
   b. Proposed changes are in keeping with the general intent of Contract Documents.
   c. The request is timely, fully documented and properly submitted.
   d. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
   e. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
   f. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
   g. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
   h. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
   i. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
   j. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
   k. Where a proposed substitution involves more than one prime Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

D. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

E. Refer to SUBSTITUTION REQUEST FORMS ON THE FOLLOWING PAGES.

END OF SECTION 01 25 00

REQUEST FOR SUBSTITUTION

Submit a copy of this form for each requested substitution. Fill in all blanks, check all boxes that apply and attach all necessary supporting data.

SUBSTITUTION NO.: _____

Specified Item: _____

Specification Section(s)/Paragraph(s): _____

Drawing Number(s): _____

Proposed Substitute: _____

(include, as applicable, manufacturer's name & address, trade name & model number of product and name of fabricator or supplier)

Reason for Proposed Substitution:

_____

_____

_____

Net Change to Contract Sum: ☐ No Change ☐ Deduct $_____ ☐ Add $_____

Change to Contract Time: ☐ No Change ☐ _____ Days

The following required supporting documents are attached (Check all that apply):

- ☐ Complete Product Data
- ☐ Itemized comparison of properties of proposed product to specified product.
- ☐ List of other projects on which proposed has been used, with project name, design professional's name and owner contact.
- ☐ List of maintenance services and replacement materials available.
- ☐ Statement of effect of substitution on construction schedule.
- ☐ Description of change that will be required in other work or products if substitute product is approved.

Additional Information:

_____

_____

_____

_____

_____

REQUEST FOR SUBSTITUTION

The undersigned testifies that he/she:

- Is submitting this substitution request within the limits set forth in the Contract Documents.
- Has investigated the proposed product and determined that it is equal or better than the specified product.
- Will provide the same warranty for the proposed product as for the specified product.
- Will coordinate installation and make other changes as required for the work to be complete in all respects, including: (a) redesign and (b) additional components and capacity required by other work affected by the change.
- Waives all claims for additional costs for evaluation of the substitution request, redesign if required, and reapproval by authorities having jurisdiction, if required.
- Waives reimburse the Owner for additional costs for evaluation of the substitution request, redesign if required, and reapproval by authorities having jurisdiction, if required.

Contractor's Signature: _____

Typed or Printed Name: _____

Title: _____

Company: _____

Address: _____

Phone Number: _____

Owner Approval: _____ Date: _____

Construction Manager Approval: _____ Date: _____
If Applicable

USA Architects, P.A. Approval: _____ Date: _____

Consulting Engineer Approval: _____ Date: _____

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SECTION 01 26 00 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to this section.

1.2 SUMMARY

A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 01 Section "Submittals" for requirements for the Contractor's Construction Schedule.

2. Division 01 Section "Application for Payment" for administrative procedures governing applications for payment.

3. Division 01 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.

2. Unless otherwise indicated in the proposal request, within 20 days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.
   a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.

2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts, if allowed and or applicable.

4. Comply with requirements in Section "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

C. Proposal Request Form: Use AIA Document G 709 for Change Order Proposal Requests.

D. Backup: Notwithstanding the aforementioned requirements, the following information shall be provided as backup for all Change Order Requests, Failure to provide complete information as described below shall be cause for rejection. Provide the following, including but not limited to:

1. A clear description of the Change and reason for the Change Order Request

2. A cost estimate spreadsheet broken down as follows to show:
   a. Labor, material, and equipment costs for all Contractors and Subcontractors
   b. Labor rate sheets, showing actual rate paid including fringe benefit costs for the total Labor rate
   c. Material costs, provide actual invoices or estimates to verify all material costs
   d. Equipment costs for hours worked including delivery, provide actual rental receipts or Bluebook rates for Contractor owned equipment
   e. Add Bond and Insurance costs at actual cost or percentages used in the original bid
   f. Any other actual costs and explanation of costs
   g. Allowable profit of 10% for work performed by Contractors own forces
   h. Allowable profit of 5% on work performed by a Subcontractor
   i. Total requested amount to be added or Deleted from the Contract
   j. Total markup not to exceed 15%
   k. Explanation and reasoning for anticipated schedule impact if any.
   l. Refer to A 201 Article 7.2

1.4 CHANGES IN THE WORK

A. Tabulate cost breakdown into subcontracts and trades for each of which the quantity, labor, material, other cost and resulting final cost per unit shall be indicated. Quantity, labor, material, other cost and cost per unit generally include but are not necessarily limited to the following:

1. Quantity; total number of items for each portion or unit of work as determined from the change.

2. Labor; on site labor for the handling and installation of material from point of delivery at site.

3. Material; cost of material as delivered to the site for installation and erection.

4. Other cost; rental equipment, depreciation, site office, administration, overhead and profit, testing survey and layout, samples and all other costs not included in labor and material.

B. When a change in the work includes a category or categories of work both added to and deducted from the Contract, the total quantities of added work and of deleted work shall be determined separately for each category and the appropriate unit price or net cost of the work shall be applied to the difference between the two total quantities.

C. Unit prices shall be inclusive of all costs and shall be applied to units of measure as defined in the specifications for each category of work.

D. For all extra work performed by the Contractor, the gross cost to the Owner shall include the net cost of the work to the Contractor plus an allowance for overhead and profit not to exceed, (See General Conditions, Article 7), of the net cost.

E. For all extra work performed by a Subcontractor, the gross cost to the Owner shall include the net cost of the work by the Subcontractor plus an allowance for overhead and profit not to exceed, (See General Conditions, Article 7), of his net cost, plus the General Contractor's overhead and profit not to exceed, (See General Conditions, Article 7), of the Subcontractor's net cost. In no case shall the total allowance for overhead and profit exceed, (See General Conditions, Article 7), of the net cost of the work.

F. Net cost of extra work shall be the actual or prorated cost of:

1. In all cases to be in compliance with the General Conditions, Article 7.

G. Gross costs shall be net costs plus allowances listed in the General Conditions, Article 7. Such allowances shall be inclusive of all costs for construction superintendent, supervision, engineering, overhead, profit, administrative and site office expenses and all other general expenses.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor on AIA Form G701, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable) PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 26 00

SECTION 01 29 00 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.

1.3 SCHEDULE OF VALUES

A. The Contractor shall coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
   a. Contractor's construction schedule.
   b. Application for Payment form. (G702 and G703)
   c. List of subcontractors.
   d. Schedule of alternates.
   e. List of products.
   f. List of principal suppliers and fabricators.

2. Submit the Schedule of Values to the Architect and Owner for review and approval at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial Application for Payment.
   a. Submit electronic pencil copy to the Owner and Architect for initial review and approval.
   b. Submit 3 copies of Schedule of Values to Architect and Owner.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location.
   b. Name of the Architect.

c. Project number (if applicable).
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
   a. Generic name.
   b. Related Specification Section.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that have affected value.
   g. Dollar value.
   h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.

4. Bonds, Insurance and like items shall be listed separately on the Schedule of Values and at the actual cost.

5. Breakdown shall show Labor and Material separately, to best facilitate evaluation of a bill for materials that are staged on site but not yet installed. Failure to provide said breakdown will necessitate all materials to be installed as part of the work prior to billing for this work.

6. Round amounts off to the nearest whole dollar; the total of the Schedule of Values shall equal the Contract Sum (including Alternate Bids as applicable).

7. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Breakdowns shall be Labor and Material by floor and by area, or other means, to allow for an expedient review of the work in place.

C. Billing Instructions

1. Bonds, Insurance and items similar in nature shall be listed separately and billed at the actual cost. Backup such as invoices, or other verification, may be requested by the Owner from time to time, for these and other items. Such backup shall not be unreasonably withheld. Schedule of Values must be submitted on AIA G702/G703, or identical similar form.

1.4 STORED MATERIALS

A. The Owner may agree to pay for materials suitably stored offsite, that are dedicated for use on this project, and provided that the following criteria are met. Required documentation shall include at a minimum the following:

1. Bill of Sale totaling the amount of the stored material payment request. Invoice shall name the Owner and others to be determined throughout the course of the project.

2. Pictures of Materials showing labels indicating the material is designated for the Project.

3. Inventory list of the materials and value whenever possible.

4. Materials stored off-site must be housed in a bonded warehouse or other similar facility. Submit verification showing the warehouse to be bonded, and Insurance Certificate for the stored materials, naming the Owner and others to be determined as 'additional insured' parties.

1.5 APPLICATIONS FOR PAYMENT:

A. Payment Application Times: Each Payment Application shall be made at the end of each month and shall be based upon the entire month's completed work. A "pencil copy" shall be submitted on or about the 25th of each month showing the projected completion of work for the month, for review.

B. Application Preparation: Complete every entry on the Application for Payment Form (G702 and G703), including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application. Provide description of Change Order work. Do Not bill for Change Order work until the Change Order has been officially approved by the Board Resolution.

C. Affirmative Action Requirements: Comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 as follows.

1. Submit a copy of the current Monthly Project Workforce Report (Form AA-202) submitted to the Department of Labor & Workforce Development, Construction EEO Compliance Monitoring Program, and to the public agency compliance officer. The Contractor shall also cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job programs for outreach and training of minorities and women.

D. Local Participation Reporting: Report the number of Cumberland County residents have been employed on the project during the preceding month.

E. Transmittal: Submit 3 executed copies of each Application for Payment to the Architect / Owner by means ensuring receipt within 24 hours; each copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 29 00

SECTION 01 31 13 - PROJECT 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. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination as a responsibility of each contractor.

2. Special responsibility of the General Contractor for coordination.

3. Administrative and supervisory personnel.

4. General installation provisions.

5. Cleaning and protection.

B. Field engineering is included in Section "Field Engineering".

C. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings".

D. Requirements for the Contractor's Construction Schedule are included in Section "Submittals".

1.3 COORDINATION

A. Coordination: Each Contractor shall coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Confirm any variation from the Construction Documents with the Architect, before proceeding.

3. Make adequate provisions to accommodate items scheduled for later installation.

1.4 SPECIAL RESPONSIBILITIES OF THE GENERAL CONTRACTOR AS PRINCIPAL PROJECT COORDINATOR

A. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.

2. Installation and removal of temporary facilities.

3. Delivery and processing of submittals.

4. Progress meetings.

5. Project Close-out activities.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the w Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

A. Logistics Plans: Provide to the Owner for Owner’s information prior to start of any work on site.

B. Crane Pick Plans: Provide picking information to Owner for Owner’s information one week prior to activity.

1. Crane picks of every kind will require a "Lift Plan". Lift plans shall show position of crane, loads imposed, crane size and boom height and radius and other relevant information. Crane lift plans shall be reviewed by the General Contractor and in cases where the loads imposed exceed the established bearing capacity of the subgrade additional review will be provided by the Soils and/or Structural Engineer, in no case will cranes be permitted to pick or install materials without having a reviewed and approved Crane Lift plan. In the event of a critical

lift (lift exceeding 75% of crane capacity or requiring more than one crane) a Critical Lift meeting must be held and the Owner's Construction Manager shall be invited to said meeting. In the event of crane boom height exceeding the FAA height requirements, or any local height requirements Contractor shall be responsible for filing and permitting when necessary, including all associated costs. Contractor is responsible to notify interested parties, such as local Airports, of the Mobilization and duration of cranes working on the project site.

C. Coordination Drawings: The General Contractor shall prepare and submit coordination Drawings based on appropriate information from each primary Subcontractor, where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."
4. Refer to Division 23 Section "Basic Mechanical Requirements," and Division 26 Section "Basic Electrical Requirements" for specific coordination Drawing requirements for mechanical and electrical installations, for each building.

D. Staff Names: Within 10 days of Notice to Proceed:
1. The Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities;
2. List their addresses and telephone numbers.
   a. The Contractor shall provide a list of phone numbers where the job superintendent and two responsible members of the organization can be reached in an emergency by the Owner or the Architect. These contact numbers shall include 24 hour, 7 days per week contacts for use in an emergency. If Contractor does not respond to an emergency, the Owner reserves the right to respond and charge the Contractor for any costs incurred to resolve emergency issue in the absence of the Contractor's response. The Owner shall be provided with keys for all gate locks
3. Post copies of the list in the Project meeting room, and/or the temporary field office.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the

substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities 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. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.

6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High speed operation,
21. Improper lubrication,
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01 31 13

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SECTION 01 31 19 - PROJECT MEETINGS (SINGLE PRIME CONTRACT)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
   a. Pre-Construction Conference.
   b. Pre-Installation Conferences.
   c. Coordination Meetings.
   d. Progress Meetings.

1.3 PRE-CONSTRUCTION CONFERENCE

A. The Owner may schedule a pre-construction conference and organizational meeting at the Project Site or other convenient location prior to commencement of construction activities, and/or as agreed upon by both parties. Purpose is to conduct the meeting to review responsibilities and personnel assignments, and customary administrative tasks and responsilities.

B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

C. Agenda: Attendees shall discuss items of significance that could affect progress including such topics as (list may not be all-inclusive):

   1. General:
      a. Tentative construction schedule and Critical Work sequencing.
      b. Designation of responsible personnel.
      c. Procedures for processing field decisions and Change Orders.
      d. Procedures for processing Applications for Payment.
      e. Distribution of Contract Documents.
      f. Submittal of Shop Drawings, Product Data and Samples.
      g. Preparation of record documents.
      h. Use of the premises.
      i. Office, Work and storage areas.
      j. Equipment deliveries and priorities.
      k. Safety procedures, First aid, Security, Housekeeping, Working hours.

1.4 PRE-INSTALLATION CONFERENCES

A. The Contractor shall conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The 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.

B. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
   a. Contract Documents.
   b. Possible conflicts, Compatibility problems, Options and or, Related Change Orders.
   c. Purchases and Deliveries.
   d. Shop Drawings, Product Data and quality control Samples.
   e. Time schedules and Weather limitations.
   f. Manufacturer's recommendations.
   g. Compatibility of materials.
   h. Acceptability of substrates.
   i. Temporary facilities.
   j. Space and access limitations.
   k. Governing regulations.
   l. Safety.
   m. Inspection and testing requirements.
   n. Required performance results.
   o. Recording requirements.
   p. Protection.

2. The Contractor shall record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

A. The Contractor shall conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS JOB MEETINGS

A. Progress meetings will occur at the Project site or, at another agreed upon location and shall usually be conducted every week, unless this schedule is relaxed by the Owner. The Architect will notify the Owner and Contractor of scheduled meeting dates. It is desired to coordinate Job Meetings with payment requests.

1. The Architect shall preside at each meeting and shall record results of meetings and distribute copies to everyone in attendance and to others as required.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Provide list of activities completed over the past week, and proposed for the subsequent week. Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind 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 activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including such items as:
   a. Time, Hours of Work.
   b. Quality and Work standards.
   c. Sequences, Site Utilization, Temporary facilities and services, Deliveries, Access.
   d. Off-site fabrication problems.
   e. Hazards and risks.
   f. Housekeeping.
   g. Change Orders and Documentation of information for payment requests.

D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applcable)

END OF SECTION 01 31 19

SECTION 01 33 00 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;
   1. Contractor's construction schedule.
   2. The Overall Project Schedule.
   3. Submittal schedule.
   4. Daily construction reports.
   5. Shop Drawings.
   6. Product Data and Samples.

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
   1. Permits.
   2. Applications for payment.
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of Subcontractors.

C. The Schedule of Values submittal is included in Section "Applications for Payment."

D. Inspection and test reports are included in Section "Quality Control Services."

1.3 SUBMITTAL PROCEDURES

A. Shop drawings, product data and samples will not be processed by Architect until list of subcontractors, material suppliers and fabricators is submitted as required by General and Supplementary Conditions.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
   a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
   a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
   b. If an intermediate submittal is necessary, process the same as the initial submittal.
   c. Allow two weeks for reprocessing each submittal.
   d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

C. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Number and title of appropriate Specification Section.
   i. Drawing number and detail references, as appropriate.

D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1. On the transmittal Record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

E. Contractor is responsible for all printing and distribution to all interested Contractors, subcontractors and suppliers. After Architect's review, prints bearing Architect's review stamp shall be forwarded by Contractor directly to Owner, Owner's Representative and Contractor's Superintendent at site. Contractor shall forward additional approved copies to all interested Contractors, subcontractors and suppliers on project.

F. All shop drawings, samples and/or material or equipment submittals shall bear the Contractor's stamp or seal stating that the Contractor has reviewed the submittals and they conform to the requirements of the Contract Documents.

1. By submitting shop drawings, product data, samples, and similar submittals, the Contractor represents that he has determined and verified:
   a. Dimensions, quantities, field dimensions, and relationship to existing Work.
   b. Coordination with Work to be installed later.
   c. Work on shop drawings is accurate and clearly shown.
   d. Work equipment will fit into assigned spaces with sufficient access for servicing and maintenance.
   e. Coordination with information on previously accepted shop drawings, product data, samples, or similar submittals.
   f. Full compliance with requirements of Contract Documents.

2. In reviewing shop drawings, product data, samples and similar submittals, the Architect/Engineer shall be entitled to rely upon the Contractor's representation that information in submittals is correct and accurate.

3. Submittals that are returned or rejected because of insufficient Contractor review or coordination shall not be justification for a claim for an extension of time.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Each prime contractor shall prepare a fully developed, horizontal bar-chart type Contractor's construction schedule, and submit same to the General Contractor within 15 days of the date established for "Commencement of the Work". The General Contractor/Project Coordinator will appropriately adjust each primes schedule to incorporate it into the Overall Project Construction Schedule as indicated below:

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

F. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate final completion percentage for each activity.

B. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 CPM SCHEDULE REQUIREMENTS

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within **14** days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time- scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 45 days after date established for the Notice to Proceed.
   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.

f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and inspection.
j. Commissioning.
k. Punch list and final completion.
l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
   a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
   b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.

2. Description of activity.

3. Main events of activity.

4. Immediate preceding and succeeding activities.

5. Early and late start dates.

6. Early and late finish dates.

7. Activity duration in workdays.

8. Total float or slack time.

9. Average size of workforce.

10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.

2. Changes in early and late start dates.

3. Changes in early and late finish dates.

4. Changes in activity durations in workdays.

5. Changes in the critical path.

6. Changes in total float or slack time.

7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.

2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.7 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's construction schedule and the Overall Project Schedule, prepare a complete schedule of submittals. Submit the schedule within 15 days of the Notice to Proceed.

1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

2. Prepare the schedule in chronological order; include submittals required during the first 60 days of construction. Provide the following information:
   a. Scheduled date for the first submittal.
   b. Related Section number.
   c. Submittal category.
   d. Name of subcontractor.
   e. Description of the part of the Work covered.

B. Distribution: Following response to initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.8 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
   1. List of subcontractors at the site.
   2. Approximate count of personnel at the site.
   3. High and low temperatures, general weather conditions.
   4. Accidents and unusual events.
   5. Meetings and significant decisions.
   6. Stoppages, delays, shortages, losses.
   7. Meter readings and similar recordings.
   8. Emergency procedures.
   9. Orders and requests of governing authorities.
   10. Change Orders received, implemented.
   11. Services connected, disconnected.
   12. Equipment or system tests and start-ups.
   13. Partial Completions, occupancies.
   14. Substantial Completions authorized.

1.9 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.
   6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48".
   7. Initial Submittal: Submit six (6) blue- or black-line prints for the Architect's review; all but one print will be returned.
      a. One of the prints returned shall be marked-up and maintained as a "Record Document".
   8. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

   1. Preparation of coordination Drawings is specified in section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

   2. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.10 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

   1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
      a. Manufacturer's printed recommendations.
      b. Compliance with recognized trade association standards.
      c. Compliance with recognized testing agency standards.

d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Submittals: Submit six (6) copies of each required submittal; The Architect or Engineer will retain one, and will return the others marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

4. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.11 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Include the following:
   a. Generic description of the Sample.
   b. Sample source.
   c. Product name or name of manufacturer.
   d. Compliance with recognized standards.
   e. Availability and delivery time.

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
   a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
   b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
   c. Take specific note where it is noted that ‘physical samples’ are required and that printed or electronic color charts are not acceptable.

3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
   a. Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

5. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
   b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.
   a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.12 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp.

C. Unsolicited Submittals: Unsolicited Submittals and Submittals not required by the Contract Documents may not be reviewed, may be discarded or returned to the sender without action.

D. Repetitive Submittals: The Architect will take appropriate action TWICE (2 times), for each item submitted. Submittals requiring more than two (2) reviews due to inadequate or incomplete information, shall be subject to a review fee for each subsequent submittal. This fee shall be based upon the hourly rate of the Architect, charged to the Owner, and deducted from the Contract amount.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01 33 00

SECTION 01 40 00- QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.

1. The Contractor shall employ and pay an independent agency, to perform specified quality control services.
    a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

2. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
    a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
    a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
    b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
    c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
    d. Security and protection of samples and test equipment at the Project site.

B. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
   a. Date of issue.
   b. Project title and number.
   c. Name, address and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Location of sample or test in project.
   k. Ambient conditions at the time of sample-taking and testing.
   l. Professional opinion as to whether Work complies with Contract Documents requirements.
   m. Name and signature of laboratory inspector.
   n. Recommendations onretesting.

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

1.6 TRADESMEN & WORKMANSHIP

A. Ensure that tradesmen performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality levels for workmanship in completed work. Remove and replace work which does not comply with workmanship standards as specified and as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector 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, 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, 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 re-inspecting corrected work.

B. Special Tests and Inspections: Conducted by a qualified testing agency and special inspector as required by authorities having jurisdiction, 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 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 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 re-inspecting corrected work.

C. Special Inspections Required:

1. Fabrication of Structural Load-Bearing Members/Assemblies, Section 1704.2.5: These inspections are normally handled through an in-plant, quality-control process and reports are forwarded to the local construction code office when the elements are delivered.

2. Steel Construction, Section 1705.2: This section requires the inspection of certain aspects of the on-site erection of steel including welding, high-strength bolting, and joint connection details with specific exceptions listed. Per N.J.A.C. 5:23-5.3, special inspectors are authorized to carry out field inspections for steel construction using the above-referenced section and the following:
   a. STRUCTURAL WELDING SPECIAL INSPECTOR -- Inspections in compliance with AWS D1.1.

b. STRUCTURAL STEEL AND BOLTING SPECIAL INSPECTOR -- Inspections to verify compliance with the details shown on the approved construction documents such as bracing, stiffening, member locations, and proper application of joint details at each connection. Also, high-strength bolts to be periodically inspected in accordance with AISC specifications.

3. Concrete Construction and Masonry Construction, Sections 1705.3 and 1705.4: These sections address the placement of structural concrete and masonry elements. Per N.J.A.C. 5:23-5.3, special inspectors are authorized to carry out field inspections for concrete and masonry construction using the above-referenced sections and the following:
   a. STRUCTURAL MASONRY SPECIAL INSPECTOR -- Inspections vary based on "occupancy category" as per Section 1705.4.
   b. CONCRETE PLACEMENT, REINFORCED CONCRETE, AND PRESTRESSED CONCRETE SPECIAL INSPECTORS -- Inspections per the following:
      1) Reinforced Concrete Only: Inspection of reinforcing steel, including prestressing tendons, and placement.
      2) Reinforced Concrete Only: Inspection of reinforcing steel welding:
         a) Verification of weldability of reinforcing steel other than ASTM A706.
         b) Inspect single pass fillet welds, maximum 5/16".
         c) Inspect all other welds.
      3) Inspect anchors cast in concrete.
      4) Inspect anchors installed in hardened concrete members:
         a) Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.
         b) Mechanical anchors and adhesive anchors not defined above.
      5) Verification of the use of required design mix.
      6) Prior to concrete placement fabricate specimens for strength tests, perform slump and air-content tests, and determine the temperature of the concrete.
      7) Inspection of concrete and shotcrete placement for proper application techniques.
      8) Verify maintenance of specified curing temperature and techniques.
      9) Prestressed Concrete Only: Inspection of prestressed concrete:
         a) Application of prestressing forces.
         b) Grouting of bonded prestressing tendons.
      10) Inspect erection of precast concrete members.
      11) Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete, and prior to removal of shores and forms from beams and structural slabs.
      12) Inspection of formwork for shape, location, and dimensions of the concrete member being formed.

4. Soils, Section 1705.6: A soils report, required as per Section 1803 of the Building Subcode, is used to determine compliance with the placement of load-bearing fill.

5. Sprayed, Fire-Resistant Materials, Section 1705.14: Special inspections are required for sprayed, fire-resistant materials applied to structural elements and decks. Details include structural member surface conditions, application, thickness, density, and bond strength. Per

N.J.A.C. 5:23-5.3, special inspectors are authorized to carry out field inspections for sprayed, fire-resistant materials using the above-referenced section and the following:

a. SPRAY-APPLIED FIREPROOFING SPECIAL INSPECTOR -- Inspections are to be based on the fire-resistance design as designated in the approved construction documents.

1.8 Additional Owner Testing:

A. Asphalt: Thickness, smoothness and density. See Specification 32 12 16 for material requirements

B. Resistivity Testing: Static on Control Floors. See also Specification 09 65 36 for material requirements

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 SCHEDULING

A. After the required 72-hour notice, the Owner will facilitate the initial inspection visit. Subsequent scheduling for all inspections shall be the Contractor's responsibility. The Contractor shall be responsible to make the worksite and all applicable items of construction available for the work of the Testing Service, and to coordinate his activities to minimize the time required by the Testing Service on site. The Contractor will bear no cost resulting from the firs three mis-schedules due to Contractor cancelation or other field or Contractor related issues. Future mis-schedules shall be paid at the expense of the Contractor at the Owner's discretion and at the actual cost charged by the Testing Service. The Contractor shall copy the Owner with all communications with the Testing Service, and shall provide timely written confirmation of all verbal communications. The Owner shall be so notified so that they can arrange to be present at any, or all tests and inspections.

B. Reports from the Testing Service shall be sent directly to the Owner, with electronic copy to the Contractor, to assure expedient distribution of required information.

3.2 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

3.3 REPLACEMENT OF WORK

A. Within 24 hours after rejection of work pursuant to the General Conditions, remove all materials and equipment so rejected and immediately replace work, at the Contractor's cost, to the satisfaction of the Architect. Should the work of the Owner or other Contractors be damaged by such removal or replacement, the Contractor shall reimburse the Owner or other Contractors for all costs incurred for correcting damage.

END OF SECTION 01 40 00

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SECTION 01 42 19 - REFERENCE STANDARDS AND DEFINITIONS

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. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect," "requested by the Architect," and similar phrases.

D. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
   a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

G. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

H. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 50 Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mode are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where 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. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

C. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.5 SUBMISSIONS

A. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 19

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SECTION 01 50 00 - TEMPORARY CONSTRUCTION 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. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1. Pay for all fees and permits. Pay all usage costs required for temporary services.

B. Temporary construction and support facilities required include but are not limited to:
1. Field offices and storage sheds.
2. Sanitary facilities, including drinking water.
3. Light and Temporary Heat and Ventilation.
4. Telephone service.
5. Temporary enclosures, including building security.
6. Hoists.
7. Temporary Project identification signs and bulletin boards.
8. Waste disposal services, Rodent and pest control.
9. Construction aids and miscellaneous services and facilities.

C. Security and protection facilities required include but are not limited to:
1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Environmental protection.

1.3 DIVISION OF RESPONSIBILITIES

A. Each Contractor is responsible for:
1. Installation, operation, maintenance and removal of each temporary service or facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each such service or facility.
2. Plug in electric power cords and extension cords, and supplementary plug in task lighting and special lighting necessary exclusively for its own activities.
3. Field offices, storage sheds and Waste disposal services.
4. Telephone service.
5. Hoisting requirements.
6. Secure lockup of its own tools, materials and equipment.

7. Construction aids and miscellaneous services exclusively for its own work activities.

1.4 USE CHARGES

A. Other entities using temporary services and facilities include, but are not limited to:
   1. Other non-prime Contractors.
   2. The Owner's work forces.
   3. The Architect and his consultants.
   4. Testing Agencies
   5. Personnel of government agencies.

1.5 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, Fire Department and Rescue Squad rules.
   5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

   1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

   2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with the National Electric Code (NFPA 70), latest editions.

   3. Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdiction.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

C. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

E. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

F. First Aid Supplies: Comply with governing regulations.

G. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

H. Contractor to provide fencing at all exterior excavations required for utilities, etc. Coordinate requirements with Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switchgear.

1. Except where overhead service must be used, install electric power service underground.

2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

2. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

3. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

4. The Contractor shall provide constant protection against rain, wind, storms, frost or heat so as to maintain the work, materials, apparatus and fixtures free from damage. At the end of each day's work, cover work likely to be damaged.

5. Wherever a Contractor provides openings through walls or slabs, each location shall be adequately protected at the end of each working day with temporary enclosures to make these areas tight. Openings through exterior walls shall be water tight.

C. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

1. The Contractor shall provide and operate all hoists and derricks and furnish and erect all ladders and scaffolding required by him and his subcontractors, constructed to afford proper protection to craftsmen, their work and other work in progress and previously executed. Hoists, derricks and other apparatus shall be equipped with safety devices required by law and shall be so placed as not to interfere with, or damage, any work or property.

D. Collection and Disposal of Waste: Collect and remove waste from construction areas and elsewhere daily and additionally at the Owner's direction. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.4 PROJECT SIGNS

A. The General Contractor shall provide and erect a painted Project Sign at the site, at the direction of the Owner. Construction sign shall be a simple painted plywood project banner (4′ x 8′ minimum), with support framing engineered and sealed by a licensed structural engineer, including the following markings at a minimum (items #1 and #2 below shall be largest and most prominent; other items shall be both smaller and equal in size):
   1. Project name.
   2. Owner name with logo
   3. Owner′s agent (construction manager) name with logo.
   4. Architect's name with logo
   5. Consulting Engineer's name with logo
   6. General Contractor name with logo

B. Individual advertising signs will not be permitted.

C. Signs needed to direct deliveries will be permitted with the approval of the Owner required before erection on the site.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Temporary Fire Protection: Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

5. No welding, cutting by torch, or Work utilizing or causing inflammable waste shall be done unless adequate fire protection is provided and maintained for the duration of the Work in the area or operations.

6. No fires for any purpose will be permitted on the Project. Remove all refuse from the Owner's property.

B. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

C. The Contractor shall provide barricades, guard lights and other appurtenances in the area of his operations for the protection of workmen and public as required by applicable regulations, and for the protection of streets, lighting, hydrants, walks, curbs and adjacent grounds and planting, for the duration of such operations. He shall bear the costs of damage caused by him, his Subcontractor or the employees of each. Warning lights shall be blinker type, battery or electrically operated. Open flame torches are not permitted.

D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making

tools and equipment to hours that will minimize complaints from persons or firms near the site.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. Fence to be minimum 6′ high, portable, chain link type, with weighted post bases.

1. Extent of Fence: As indicated on Drawings. If not indicated, provide fencing as agreeable to the Owner, to prevent people and animals from easily entering the site, except by entrance gates.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
3. See also Section 011100 for fencing required for tree and plant protection.

3.6 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or 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 the 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 the Contractor. The Owner reserves the right to take possession of Project identification signs.

2. If the Contractor fails to carry out his responsibilities in providing temporary utilities and facilities, as set forth above, the Owner reserves the right to take action as he deems proper for the protection and conduct of the Work and to deduct the cost thereof from the amount due the Contractor.

END OF SECTION 01 50 00

SECTION 01 60 00 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."

C. Standards: Refer to Section "Reference Standards and Definitions" for applicability of industry standards to products specified.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
    a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
    b. "Foreign Products", as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. The Contractor and all Subcontractors are responsible for providing products and construction methods that are compatible with products and construction methods of other separate Contractors.

2. If a dispute arises between Contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must bereplaced.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

1. No available domestic product complies with the Contract Documents.

2. Domestic products that comply with Contract Document are only available at prices or terms that are substantially higher than foreign products that also comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which 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 after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
   a. Name of product andmanufacturer.
   b. Model and serial number.
   c. Capacity and Ratings.
   d. Speed.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces. Contractor must have staff on site to receive all deliveries. The Owner or Owner's Agent will not receive deliveries on behalf of the Contractor.

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 the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

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

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.

2. Semi-Proprietary Specification Requirements: Where three (3) or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
   a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
   a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
   a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

B. Fiber, plastic, lead plugs and shields and any device using wood screws are not acceptable as fastening devices to plaster, tile, concrete or masonry. Use expansion bolts or driven devices in solid construction and toggle bolts in hollow construction.

C. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

3.2 PROTECTION

A. Each Prime Contractor shall be responsible for proper care and protection, and shall protect and be responsible for damage to his work or materials from the date of the Contract until final payment is made and shall make good, without cost to the Owner, all damage or loss that may occur during this period. All materials which may be affected by the weather shall be covered and protected to keep them free from damage while they are being transported to and stored on the site. Should any material be found defective or in any way contrary to the contract, this material, no matter in what stage of completion, may be rejected by the Architect and shall be removed from the premises at once.

END OF SECTION 01 60 00

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SECTION 01 70 00 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
   1. Inspection procedures.
   2. Project Record Document and Operating and Maintenance Manual submittal.
   3. Submittal of warranties.
   4. Final cleaning.

B. Other administrative submittals required for project closeout (Final Payment) are enumerated in the Division 01 Section, 'Applications for Payment'.

C. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 02 through 49.

D. Required Owner training is specified in Division 01 Section 'Demonstration and Training'.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

   1. In the Application for Payment that coincides with, or follows, when Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
      a. If 100 percent completion cannot be shown, include a list of incomplete items (Contractor's Punchlist), the value of incomplete construction, and reasons the Work is not complete.
      b. Contractor's Punchlist. The Contractor shall prepare his Punchlist, documenting incomplete and/or non-conforming work, with copy to be provided to the Architect and Owner. Upon receipt of the Contractors "Punchlist" the Architect and Owner will schedule the Architect's Punchlist walkthrough. From the Contractor's information, and project walkthrough, the Architect's "Punchlist" is formulated. The Architect will distribute his "Punchlist" to the Contractor in order for the

Contractor to address the Punchlist items. Time is of the essence and the "Punchlist" must be completed as promptly as possible. A mutually agreeable timeframe shall be established. Upon completion of the work by the Contractor and sign off by the Contractor verifying the work is complete (contractor shall initial and date each item of the Punchlist as it is completed), and a written request from the Contractor, the Architect and Owner will perform a walkthrough review of the "Punchlist" items to verify that the work is complete The Architect and Owner will review the "Punchlist" items for completeness, and will do so no more than two times. Should subsequent Punchlist reviews be deemed necessary, due to the failure of the Contractor to address all items, the Contractor shall pay for the Architect and Owner's time to re-review the "Punchlist" items for completeness.

2. Advise Owner of pending insurance change-over requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

5. Submit record drawings, maintenance manuals, final damage or settlement survey, property survey, and similar final record information.

6. Deliver tools, spare parts, extra stock, and similar items.

7. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
   1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
   2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request. Submit two (2) copies of each document below, and one (1) electronic copy on thumb drive, disc or other suitable electronic storage media.

   1. Submit Contractors Affidavit of Payments, Debts and Claims. AIA Document G706.

   2. Submit Contractors Affidavit of Release of liens AIA Document G706A.

3. Submit Consent of Surety to Final Payment. AIA Document G707.

4. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

5. Submit a certified copy of the Architect's final inspection list (punch list) of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.

6. Submit Contractor's statement that his final application, as presented, is the final bill and no other claims will be presented.

7. Submit a final liquidated damages settlement statement (if necessary).

8. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

9. See also General Conditions AIA A201, item 9.10.2 for additional information.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Architect.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings (Contractor As-Builts): Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

3. Note related Change Order numbers where applicable.

4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Include Contractor or responsible Subcontractor firm name, address, phone number, names of Project Manager and Superintendent and date of Record Drawing submission.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications. Upon completion of mark-up, submit one (1) complete set of record Product Data to the Architect for the Owner's records.
   1. Material and Equipment Warrantees and Operation and Maintenance (O&M) Manuals. Match each set of Product Data with corresponding executed warranty documentation, and associated O&M information.
   2. Organize all this items into a 3-ring binder (or binders) in the same order as the items appear in the Specifications Table of Contents.

E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Attic Stock. Provide attic stock for all applicable items, as enumerated in Sections 02 through 49. Deliver to the location pre-determined by the Owner, and secure signature and printed name of the individual who received the attic stock materials on behalf of the Owner on a transmittal that lists and quantifies the items being delivered. Submit signed transmittal with other Record documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
   a. Remove labels that are not permanent labels.
   b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition.
   c. Clean the site, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

3.2 WARRANTIES & GUARANTEES

A. In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.

B. The Contractor shall provide a written warranty covering all work performed by him for a period of two years as stipulated in the General Conditions.

END OF SECTION 01 70 00

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SECTION 01 71 23 - FIELD ENGINEERING

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. General: This Section specifies administrative and procedural requirements for field engineering services (as applicable), including, but not necessarily limited to, the following:

1. Land survey Work.

2. Civil engineering services.

3. Structural engineering services.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.

B. Final Property Survey: Submit 10 copies of the final property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Closeout".

1.4 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered in the State where the project is located, to perform land surveying services required.

B. Engineer: Engage a Professional Engineer of the discipline required, registered in the state in which the Project is located, to perform required engineering services.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Owner will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing utilities and equipment: 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 and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.2 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.

2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

2. 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.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.

E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".

END OF SECTION 01 71 23

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SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, includingneral and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Demolition of selected portions of the building for alterations is included in Section "Selective Demolition."

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
   a. Bearing and retaining walls.
   b. Structural concrete.
   c. Structural steel.
   d. Lintels.
   e. Timber and primary wood framing.
   f. Structural decking.
   g. Stair systems.
   h. Miscellaneous structural metals.
   i. Equipment supports.
   j. Piping, ductwork, vessels and equipment.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment.
   b. Air or smoke barriers.
   c. Water, moisture, or vapor barriers.
   d. Membranes and flashings.
   e. Fire protection systems.
   f. Noise and vibration control elements and systems.
   g. Control systems.
   h. Communication systems.
   i. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: A Contractor, subcontractor or sub-subcontractor requiring changes in existing work shall have such changes performed by the trades skilled in performing the particular work and such changes shall be at the expense of the Contractor, subcontractor or sub-subcontractor requiring the change. Review changes with the Architect prior to proceeding with the work and include installation of such reinforcement of the work as the Architect may direct.

B. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

C. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

D. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. 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.

3. Firestopping and draftstopping.
   a. Where fire rated and/or smoke barrier construction (walls, floors or ceilings) are penetrated, all penetrations shall be fire-safed and sealed using appropriate fire rated materials and approved methods.
   b. Where non-fire rated construction (walls, floors or ceilings) are penetrated, the penetration shall be sealed tight with approved draftstopping materials.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01 73 29

SECTION 01 78 30 - WARRANTIES

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. Warranties are hereby defined to include general administrative and procedural requirements required by the Contract Documents, including manufacturer's standard warranties on products, systems and special warranties.

1. Refer to the General Conditions for terms of the Contractor's warranty of workmanship and materials.

2. Specific requirements for warranties, products and installations that are specified to be warranted, are included in the individual Sections of Divisions 02 – 49.

3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the Warranty on the Work that incorporates the products. A warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes or fraud.

1.3 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents to extend time limits provided by standard warranties

1.4 WARRANTY REQUIREMENTS

A. Contractor shall obtain and assign to Owner all express warranties given to Contractor by any subcontractor or by any vendor supplying materials, equipment or fixtures to be incorporated into the Project.

1. Contractor expressly warrants to Owner that all materials and equipment to be incorporated into the Work shall be new unless otherwise specified.

2. Contractor expressly warrants to Owner that all Work shall be of good quality, free from all defects and in conformance with the Contract Documents.

3. Contractor further warrants to Owner that all materials and equipment furnished under the Contract Documents shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturers, fabricators, suppliers or processors except as otherwise provided for in the Contract Documents.

B. Related Damages and Losses: Contractor shall promptly correct, upon receipt of written notice from Owner, any portion of the Work which is found to be defective or otherwise not in conformance with the requirements of the Contract Documents.

1. In the event that any defective or non-conforming Work is deemed by Owner in its sole discretion to present an immediate threat to security, Owner shall be entitled to correct and fix such defective or non-conforming portions of the Work, and Contractor shall reimburse Owner for all costs and expenses incurred by Owner in performing such Work.

2. When correcting warranted Work that has failed, remove and replace other adjacent Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 WARRANTY MANAGEMENT PLAN

A. Owner shall be the administrator of the Warranty Management Plan and will monitor all warranties during specified warranty terms.

B. Contractor shall develop a warranty implementation plan which shall include, but not be limited to:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the Contractor's organization, Subcontractors, manufacturers or suppliers.

2. Listing of all Certificates of Warranty for extended warranty items, to include roof, HVAC test and balance, pumps, motors, transformers, fire protection and alarm system, sprinkler system, lightning protection system, surge suppression, etc.

3. A list for each warranted item, equipment, and feature of construction or system indicating:
   a. Name of item.
   b. Model and serial number.
   c. Installation location.
   d. Name and phone number of manufacturers or suppliers.
   e. Spare parts source.
   f. Terms of warranty.
   g. Cross reference to warranty certificate.
   h. Starting date and duration of warranty period.
   i. Summary of maintenance procedures required to continue warranty in force.
   j. Cross reference to respective Operations & Maintenance Manual section.
   k. Organization, names and phone numbers of continuously available warranty, service personnel, size of local service area.
   l. Expected response time and repair time expected for various equipment.

4. The Contractor's plan for attendance at warranty inspections.

5. Procedure and status of tagging all equipment covered by extended warranties.

6. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

C. Warranty Work Under Performance Bond:

1. In the event the Contractor fails to commence and diligently pursue warranty work, the Owner will have the work performed by others, and after completion of the Work, will have the right to recoup expenses, including administrative expenses, from the bonding company.

2. Following oral or written notification of required warranty work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause to proceed against the Contractor.

1.6 SUBMITTALS

A. Contractor shall submit list of all warranties specified for this project to Architect/Engineer for approval, not later than sixty (60) days after Owner "Notice To Proceed" (NTP). List shall be in electronic format (WORD). List shall include the following:

1. Six (6) digit, CSI Section number of specifications in numerical order.

2. Specification name.

3. Listing of items within the specification section to be warranted.

4. Warranty term (years and months).

B. Contractor shall submit written warranties to the Architect/Engineer prior to the date of scheduled Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for the warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranty to the Architect/Engineer within fifteen (15) days of completion of that designated portion of the work.

C. Special Warranties: When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, or supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect/Engineer for approval prior to final execution.

1. Refer to individual Sections of Divisions 02 through 49 for specific content requirements, and particular requirements for submittal of special warranties.

D. Special Warranty Requirements Reference Guideline

1. Contractor shall refer to the "Special Warranty Requirements Reference Guideline" at end of this Section, regarding minimum warranty term requirements that exceeds one (1) year. Contractor shall use this reference guideline as a checklist in addition to other warranties that may be specified in other specification sections. Contractor shall mark an "X" for each applicable warranty in the column indicated.

E. Form of Submittal: Prior to Final Completion, compile two (2) originals of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Closeout Documentation Manual. Copies of the warranties shall be incorporated into the Operations and Maintenance Manuals as defined in Division 01 Section "Project Closeout".

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 WARRANTY ADMINISTRATION

A. Administration Warranty Administrator shall set up and administer jointly with Contractor/CM, Sub-Contractors, Owner's Maintenance, Facilities Director (if appropriate), a warranty inspection walk-through at six (6) months and eleven (11) months after date of Substantial Completion of the Work. (Applicable to the one (1) year warranty period.) Inspections shall be conducted for other special warranties with extended warranty periods, as specified in eachspecification section. (Note: A similar 23-month warranty inspection (walk-through) shall be conducted for roofing.)

1. Contractor's warranty excludes remedy for damage or defect caused by Owner's abuse, modifications not performed by Contractor, improper or insufficient maintenance by Owner (unless such maintenance was performed in accordance with the directions from Contractor), improper operation by Owner (unless such operations were performed in accordance with the directions from Contractor), or normal wear and tear under normal usage.

2. Contractor shall only execute warranty work authorized by Owner. All Work executed and/or completed without authorization from Owner's representative will not be recognized by Owner.

3. Contractor shall be required to obtain verification signature from Owner's Authorized Representative upon completion of warranty work. (See Par. 3.B.1 below)

B. Contractor Warranty Responsiveness Priorities and Codes

1. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, date completed and verification by Owner's Authorized Representative.

2. Warranty work shall be given a Priority by the Owner to advise the Contractor of the required response:
   a. Priority 1 (Emergency/Life Safety): Perform onsite inspection to evaluate situation, determine course of action within 4 hours, initiate work within 6 hours, work to be completed within 48 hours.
   b. Priority 2 (Urgent): Perform onsite inspection to evaluate situation, determine course of action within 8 hours, work to be completed within 5 working days.
   c. Priority 3 (Routine): All other work to be initiated within 3 days, work to completion within 28 working days.

C. Warranty Tags

1. At the time of installation, each warranted item shall be tagged with a durable, oil and water-resistant tag approved by the Owner. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and project manager signature shall remain blank until accepted.

2. Each tag shall have the following information:
   a. Type of Product/Material
   b. Model Number
   c. Serial Number
   d. Contract Number
   e. Warranty Period
   f. Inspector's Signature
   g. Construction Contractor, address, phone
   h. Warranty Contact, address, phone
   i. Response Time Priority Code
   j. Warning: Project personnel to perform only operational maintenance during the Warranty Period

END OF SECTION 01 78 30

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

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 administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Sections:

1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

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 utilizing 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 and videographer.

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 on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, three-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. 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.

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 Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "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.

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 has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 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. Basis of 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. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual.

B. Set up instructional equipment at instruction location.

3.2 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, other than Contractor's Project Manager or Superintendent, to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. 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 Architect, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of oral, written, or demonstration performance-based testing, as appropriate.

E. 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.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on video recording by dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

F. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

ENGINEERING LAB – CUMBERLAND COUNTY COLLEGE
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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of designated construction.

B. Disposal of materials.

C. Identification of utilities.

D. Sawcutting/removal of existing concrete slab-on-grade.

E. Removal and protection of items designated to be returned to the Owner.

F. Protection of all construction designated to remain.

1.2 RELATED SECTIONS

A. Division 1 - Construction Facilities and Temporary Controls: Barricades and cleanup during construction.

B. Division 1 - Contract Closeout: Project record documents.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Obtain required permits from authorities.

C. Do not close or obstruct egress width to any building or site exit.

D. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.

E. Coordinate interruption of any building systems or services as required.

F. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.4 SCHEDULING

A. Verify work schedule to coordinate with Owner’s requirements.

B. Schedule Work to precede new construction.

C. Describe demolition removal procedures and schedule.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices.

B. Protect existing materials which are not to be demolished.

C. Prevent movement of structure; provide bracing and shoring.

D. Notify affected utility companies before starting work and comply with their requirements.

E. Mark location and termination of utilities.

F. Provide appropriate temporary signage including signage for exit or building egress.

3.2 DEMOLITION

A. Disconnect, remove, cap, and identify designated utilities within demolition areas.

B. Demolish in an orderly and careful manner. Protect existing structures.

C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

END OF SECTION

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 the following:
   1. Preparing and grading subgrades for slabs-on-grade and walks.
   2. Subbase course for walks, pavements and ramps.

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.

E. Base Course: The layer placed between the subbase and surface pavement in a paving system.

F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following: (Not Applicable)

C. Samples of the following:
   1. 20 lb (9 kg) samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: The Contractor will have a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. Satisfactory Soil Materials: Refer to Geotechnical Report.

C. Unsatisfactory Soil Materials: Refer to Geotechnical Report. ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

D. Backfill and Fill Materials: Satisfactory soil materials.

E. Subbase and Base Material: Dense graded aggregate base course or soil aggregate base course. Designation I-5 conforming to NJDOT specifications.

F. Engineered Fill: Subbase or base materials.

G. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2 inch (38 mm) sieve and not more than 5 percent passing a No. 8 (2.36 mm) sieve.

H. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2 inch (38 mm) sieve and 0 to 5 percent passing a No. 50 (300 micrometer) sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility.

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep.

1. Tape Colors: Provide tape colors to utilities as follows:
   a. Red: Electric.
   b. Yellow: Gas, oil, steam, and dangerous materials.
   c. Orange: Telephone and other communications.
   d. Blue: Water systems.
   e. Green: Sewer systems.

C. Filter Fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
   a. Grab Tensile Strength (ASTM D 4632): 100 lb (45 kg).
   b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard (150 micrometer) sieve.
   c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft. (102 L/s per sq. m).

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.3 EXCAVATION

A. Explosives: Do not use explosives.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 APPROVAL OF SUBGRADE

A. Notify Architect, Engineer and testing agency when excavations have reached required subgrade.

B. When testing agency determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Architect.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.

B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.

3.9 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between existing adjacent grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

   1. Lawn or Unpaved Areas: Plus or minus 1.2 inches (30 mm).

2. Walks: Plus or minus 1.2 inches (30 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10 foot (3 m) straightedge.

3.10 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements.

1. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.
2. Shape subbase and base to required crown elevations and cross-slope grades.
3. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
4. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders at least 12 inches (300 mm) wide of acceptable soil materials and compact simultaneously with each subbase and base layer.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage areas at the direction of the Owner. Stockpile or spread soil on site as directed by Architect.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE. This section covers the excavation, trenching, and backfilling for utilities systems.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXCAVATION.

3.1.1 General. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated or as directed. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel and shall conform to 29 CFR, Part P, and all costs associated therewith shall be included in the Contract price. Earth excavation shall comprise all materials not classified as rock excavation. Rock excavation shall comprise the following: rock material in ledges, bedded deposits, unstratified masses, and conglomerate deposits so firmly cemented as to possess the characteristics of solid rock that cannot be removed without systematic drilling and blasting; and below grade concrete or masonry structures. Concrete masonry evident from surface, such as curbs, sidewalks, pavements and utility structures are <u>not</u> considered rock excavation. Rock excavation is not anticipated.

3.1.2 Trench Excavation. Trenches shall be of the necessary width for proper laying of the utility. The banks of pipe trenches shall be as vertical as practicable from the trench bottom to a point one foot above the top of the pipe being installed. The remainder of the trench sides may be sloped or widened provided there is no interference with other utilities or facilities. Care shall be taken not to overexcavate except where granular bedding is required. Stones shall be removed as necessary to avoid point bearing. Where rock excavation, as defined hereinbefore, is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated or specified. Except as hereinafter specified for wet or otherwise unstable material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is not capable of properly supporting the pipe is encountered in the bottom of the trench, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with suitable approved material. Special requirements relating to specific utilities are as follows:

3.1.2.1 <u>Sanitary Sewers.</u> The width of the trench below 1 foot above the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level may be widened as hereinbefore specified. Trenches shall be overexcavated to permit the installation of granular bedding as detailed on the drawings.

3.1.2.2 <u>Electrical and Gas System.</u> The banks of trenches shall be kept vertical below 1 foot above the top of the conduit or pipe but may be sloped or widened above that point. Trenches shall be overexcavated to permit the installation of sand bedding as detailed on the drawings.

3.2 EXCAVATION FOR APPURTENANCES. Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed, at no additional cost to the Owner.

3.3 CAUTION IN EXCAVATION (EXISTING FACILITIES.) The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utilities, structures, etc., both known and unknown, may be determined. The Contractor shall be held responsible for the repair of such structures when broken or damaged. The Contractor's attention is particularly called to this item of the Contract Documents. Particular attention shall be given to all underground utilities shown or implied on the Contract Drawings. The Contractor shall be responsible for coordinating his work with all existing utility owners known to exist in the area of construction, and shall accurately locate existing utilities along route of new utilities prior to beginning construction of the new utilities.

3.4 BACKFILLING. The trenches shall not be backfilled until all required pressure tests are performed and until the utilities systems as installed conform to the requirements specified in the several sections covering the installation of the various utilities. Where wood sheeting is used along sides of sanitary sewer trench, sheeting below one foot above the top of the pipe shall be left in place if pipe bedding has been placed against sheeting. Except as otherwise specified for special conditions of overdepths, trenches shall be backfilled to the ground surface with selected material as hereinafter specified. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved. The surface shall be restored to its original condition as near as practicable and as hereinafter specified. Pavement, base course and compacted subgrade disturbed by trenching operations shall be replaced in an acceptable manner with materials equal to the adjacent compacted subgrade, base course, and pavement, and shall be as hereinafter specified.

3.4.1 Lower Portion Of Trench. Backfill material shall be deposited in 6-inch maximum thickness layers and compacted with suitable tampers to a density of at least 95% of ASTM D 1557 maximum density until there is a cover of not less than 1 foot over sewers and 6 inches over other utility lines. If any portion of the cover in the lower portion of the trench is in the depth of special compaction and materials requirements under pavements or railroads, the special requirements shall control. Special care shall be taken not to damage the coating and wrapping of pipes and conduits.

3.4.1.1 Acceptable Backfill Materials. All material shall be sound and free of injurious amounts of deleterious materials. Material shall be as referenced in subsequent paragraphs.

3.4.1.1.1 Gas Lines and Electric Conduit. Bedding and backfill in lower portion of trench shall be sand SW, SP, SM or SC, conforming to ASTM D 2487, maximum particle size shall not exceed 1/2 inch in any dimension.

3.4.1.1.2 Sanitary Sewers. Unless otherwise indicated, bedding shall be Class B as detailed on the drawings and defined in ASTM C-12. Materials shall be angular graded stone ASTM D 448, Size No. 67. Backfill above bedding in lower portion of trench shall be either bedding material or sand or gravel classified as GW, GP, SW, or SP per ASTM D 2487. Maximum particle size shall not exceed 1-1/2 inches in any direction.

3.4.2 REMAINDER OF TRENCH. Except for special materials beneath pavement, the remainder of the trench shall be backfilled with material that is free of stones larger than 6 inches or 1/2 the layered thickness, whichever is smaller, in any dimension. Backfill materials shall be deposited in layers not exceeding the thickness specified, and each layer shall be compacted to the minimum density specified as applicable to the particular area. Degree of compaction shall be as follows, expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

3.4.2.1 Under Pavements. Remainder of trench shall be backfilled with cohesionless soils (sand or gravel) in 12 inch layers and compacted to 95 percent maximum density up to the elevations at which the requirements for pavement subgrade materials and compaction control.

3.4.2.2 All Other Areas. Twelve-inch layers, 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils.

3.5 Field Testing Control. Testing shall be the responsibility of the Contractor at his expense and shall be performed by an approved commercial testing laboratory. When test results indicate that compaction is not as specified, the material shall be removed and replaced or recompacted to meet specification requirements at no expense to the Owner. Subsequent tests on recompacted areas shall be performed to determine conformance with specification requirements.

3.5.1 Density-Moisture Determinations. Tests for determination of maximum density and optimum moisture shall be performed by the Contractor in accordance with the requirements of ASTM D-1557. Samples shall be representative of the materials to be placed. An optimum moisture-density curve shall be obtained for each principal type of material or combination of materials encountered or utilized. Results of these tests shall be the basis of control for compaction.

3.5.2 Density Control. The Contractor shall control the density of the backfill by tests made in accordance with ASTM Standard D 1556, D 2167 or nuclear devices. Nuclear testing equipment and procedures shall conform to ASTM D 2922. A density test shall be made for each foot of fill for each 400 lineal feet or less of trench. The Contractor shall make as many additional tests as he requires to obtain the specified density at all points. All test results shall be furnished by the Contractor to the Owner's Representative, certified by an independent testing laboratory approved by the Owner's Representative.

3.6 Pavement Removal and Replacement.

3.6.1 Flexible Pavement. Where construction requires cutting and replacing of flexible paving, cutting shall be so accomplished that the remaining exposed edges shall conform vertically and horizontally to a straight line. The full depth of surface and binder course shall be removed to a width of 2 feet back from each side of the trench with a saw cut on the edges. Base course shall be removed to a point one foot back from each side of the trench. The pavement replaced shall match the existing in section and depth.

3.6.2 Rigid Pavement. Where construction requires removal and replacement of rigid pavement, the cutting shall be accomplished by a concrete saw; minimum depth of vertical cut shall be 1 inch. The remaining depth of section may be broken out in any approved manner. Width of section removed shall be extended minimum of 2 feet back from each side of trench.

END OF SECTION

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 exterior portland cement concrete paving for the following:

1. Concrete aprons at building.
2. Miscellaneous pads and items.
3. Walkways.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Earthwork" for subgrade preparation, grading and subbase course.
2. Division 2 Section "Pavement Joint Sealants" for joint fillers and sealants within concrete paving and at joints with adjacent construction

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.

C. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

D. Laboratory test reports for evaluation of concrete materials and mix design tests.

E. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements. Provide certification from admixture manufacturers that chloride content complies with requirements.

1.4 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves of a 100-foot or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 775 with ASTM A 615, Grade 60 deformed steel bars.

C. Plain, Cold-Drawn Steel Wire: ASTM A 82.

D. Welded Steel Wire Fabric: ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Engineer.

E. Deformed-Steel Welded Wire Fabric: ASTM A 497.

F. Fabricated Bar Mats: Welded or clip-assembled steel bar mats, ASTM A 184. Use ASTM A 615, Grade 60 steel bars, unless otherwise indicated.

G. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

H. Epoxy-Coated Joint Dowel Bars: ASTM A 775 with ASTM A 615, Grade 60 plain steel bars.

I. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.

1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type F.

C. Normal-Weight Aggregates: ASTM C 33, Class 4, and as follows. Provide aggregates from a single source.

1. Maximum Aggregate Size: 1-1/2 inches.
2. Do not use fine or coarse aggregates that contain substances that cause spalling.
3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

D. Water: Potable.

E. Fiber Reinforcement: Synthetic fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C 1116, Type III.

2.4 ADMIXTURES

A. Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

H. Products: Subject to compliance with requirements, provide one of the following:

1. Air-Entraining Admixture:
   a. Air-Tite or Amex 210; Cormix Construction Chemicals.
   b. Sealtight AEA; W.R. Meadows, Inc.
   c. Sika AER; Sika Corp.
   d. or approved equal.

2. Water-Reducing Admixture:
   a. Chemtard; ChemMasters Corp.
   b. Type A Series; Cormix Construction Chemicals.
   c. Eucon WR-75; Euclid Chemical Co.
   d. or approved equal.

3. High-Range Water-Reducing Admixture:
   a. Super P; Anti-Hydro Co., Inc.
   b. Cormix 2000, PSI Super, or Melmet; Cormix Construction Chemicals.
   c. Eucon 37; Euclid Chemical Co.
   d. or approved equal.

4. Water-Reducing and Accelerating Admixture:
   a. Q-Set; Conspec Marketing & Manufacturing Co.
   b. Gilco Accelerator or Lub NCA; Cormix Construction Chemicals.
   c. Accelguard 80; Euclid Chemical Co.
   d. or approved equal.

5. Water-Reducing and Retarding Admixture:
   a. Type D Series; Cormix Construction Chemicals.
   b. Eucon Retarder 75; Euclid Chemical Co.
   c. Daratard-17; W.R. Grace & Co.
   d. or approved equal.

2.5 CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap-polyethylene sheet.

C. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B.

   1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
   2. Clear Waterborne Membrane-Forming Curing Compound:

      a. Clear Cure Water Base; Anti-Hydro Co., Inc.
      b. Spartan Cote WB; The Burke Co.
      c. W.B. Resin Cure; Conspec Marketing and Mfg. Co.
      d. or approved equal.

2.6 RELATED MATERIALS

A. Boiled Linseed Oil Mixture: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

B. Traffic Paint: Alkyd-resin ready-mixed, complying with AASHTO M 248, Type S.
   1. Color: White.

C. Nonslip Aggregate Finish: Fused aluminum oxide granules or crushed emery as the abrasive aggregate for a nonslip finish, with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rustproof, nonglazing, and unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: Acrylic or styrene butadiene.

E. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

2.7 CONCRETE MIX

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:

1. Compressive Strength (28-Day): 4000 psi.
2. Maximum Water-Cement Ratio at Point of Placement: 0.45.
3. Slump Limit at Point of Placement: 3 inches.

a. Slump limit for concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows with a tolerance of plus or minus 1-1/2 percent:

1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
2. Air Content: 6.0 percent for 1-inch maximum aggregate.
3. Air Content: 6.0 percent for 3/4-inch maximum aggregate.
4. Air Content: 7.0 percent for 1/2-inch maximum aggregate.
5. Air Content: 2.5 to 4.5 percent.

D. Fiber Reinforcement: Add to mix at rate of 1.5 lb per cu. yd., unless manufacturer recommends otherwise.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install 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 formwork and screeds 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 required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.

1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:

1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
2. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
3. Provide tie bars at sides of paving strips where indicated.

4. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless indicated otherwise.
2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
3. 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.
4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.

F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an 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 dislocating reinforcing, dowels, and joint devices.

H. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. 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.

K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

L. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

M. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
4. Radius: 1/4 inch.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL TESTING

A. The Contractor will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    a. Slump:
    b. Air Content:
    c. Concrete Temperature:
    d. Compression Test Specimens:
    e. Compressive-Strength Tests:

B. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

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 the following:

1. Expansion and contraction joints within portland cement concrete pavement.

B. Related Sections include the following:

1. Division 2 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:

1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.

B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.4 PRIMERS

A. Primers: Product 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials 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 backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to 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 provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag 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 sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floors and slabs-on-grade.

B. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.

C. Concrete reinforcement and accessories.

D. Vapor barrier.

1.2 RELATED SECTIONS

A. Section 079000 - Joint Sealers.

B. Division 23 - Mechanical: Mechanical items for casting into concrete.

C. Division 26 - Electrical: Electrical items for casting into concrete.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ASTM C33 - Concrete Aggregates.

I. ASTM C94 - Ready-Mixed Concrete.

J. ASTM C150 - Portland Cement.

K. ASTM C260 - Air Entraining Admixtures for Concrete.

L. ASTM C494 - Chemical Admixtures for Concrete.

M. ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

N. ASTM A165 - Deformed and Plain Billet Steel for Concrete Reinforcement.

O. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.4 SUBMITTALS

A. Product Data: Provide data on joint devices, attachment accessories and admixtures.

B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.5 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI 347 and ACI 318.

B. Acquire cement and aggregate from same source for all work.

C. Conform to ACI 305R when concreting during hot weather.

D. Conform to ACI 306R when concreting during cold weather.

1.7 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal; Portland Type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Lightweight Aggregate: ASTM C330.

D. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entraining Admixtures: ASTM C260; certified by manufacturer to be compatible with other required admixtures.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. "Sika Aer", Sika Corporation.
      b. "MB-VR or MB-AE", Master Builders.
      c. "Darex AEA" or "Daravair", W.R. Grace.
      d. "Edoco 2001 or 2002", Edoco Technical Products.

B. Water Reducing Admixture: ASTM C494, Type A, and containing no chloride ions.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. "Eucon WR-75", Euclid Chemical Co.
      b. "Pozzolith Normal", Master Builders.

c. "Plastocrete 160", Sika Chemical Corporation.
d. "Chemtard", Chem-Masters Corporation.

C. High Range Water Reducing Admixture (Super Plasticizer): ASTM C494 Type F or Type G and containing no chloride ions.
1. Products: Subject to compliance with the requirements, provide one of the following:
a. "Eucon WR-75", Euclid Chemical Co.
b. "Pozzolith Normal", Master Builder.
c. "Plastocrete 160", Sika Chemical Corporation.
d. "Chemtard", Chem-Masters Corporation.

D. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing no chloride ions.
1. Products: Subject to compliance with the requirements, provide one of the following:
a. "Accelguard 80", Euclid Chemical Corporation.
b. "Pozzolith High Early", Master Builders.

E. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and containing no chloride ions.
1. Products: Subject to compliance with requirements, provide one of the following:
a. "Edoco 20006", Edoco Technical Products.
b. "Pozzolith Retarder", Master Builders.
c. "Eucon Retarder 75", Euclid Chemical Co.
d. "Daratard", W.R. Grace.
e. "Plastiment", Sika Chemical Corporation.

F. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing chloride ions are not permitted.

2.3 REINFORCING STEEL

A. Reinforcing Steel: ASTM A165; 60 ksi yeild grade billet steel.

B. Welded Steel Wire Fabric: Plain type; ANSI/ASTM A185.

2.4 ACCESSORIES

A. Bonding Compound: Polyvinyl Acetate or acrylic base.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Polyvinyl Acetate (Interior Only):
"Euco Weld", Euclid Chemical Co.
"Weldcrete", Larsen Products Corporation.

b. Acrylic or Styrene Butadiene:
"J-40 Bonding Agent", Dayton Superior Corporation.
"Everbond", L & M Construction Chemicals.
"Hornweld", A.C. Horn, Inc.
"Sonocrete", Sonneborn-Rexnord.
"Acrylic Bondcrete", The Burke Co.

"SBR Latex", Euclid Chemical Co.
"Daraweld C", W.R. Grace.

B. Vapor Retarder: Provide vapor retarder to cover over prepared base material where indicated below slabs on grade. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
1. Polyethylene sheet not less than 10 mils thick.

C. Non-Shrink Grout: CRD-621, factory premixed grout.
1.Products: Subject to compliance with the requirements, provide one of the following:
a. Non-metallic
"Masterflow 713", Master Builders.
"Sonogrout", Sonneborn-Contech.
"Euco-NS", Euclid Chemical Co.
"Crystex", L & M Construction Chemical Co.
"Sure Grip Grout", Dayton Superior Corporation.
"Horngrout", A.C. Horn

D. Cast in Concrete Anchors: ASTM A36; structural size and configuration suitable for application.

E. PVC Piping: Polyvinyl chloride ASTM D2729, 4 inch inside diameter.

2.5 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

2.6 CONCRETE MIX

A. Prepare design mixes for each type and strength of concrete in accordance with ACI 301.
1. Compressive Strength:
28 days: 3,000 psi (foundations and slab-on-grade)
28 days: 4,000 psi (walkways)

B. Submit written reports to the Architect 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 the Architect.

C. Design mixes shall provide strength and durability as required and as indicated on drawings and schedule. Use air entrained concrete for areas exposed to weather.

D. Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant at not additional cost to the Owner and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Architect before using in work.

E. Provide maximum water-cement (WC) ratios for standard concrete as follows:
1. Subjected to freezing and thawing WC 0.50.
2. Subjected to deicers WC 0.45.

3. Subjected to brackish water WC 0.40.

F. Proportion and design mixes for standard concrete to result in concrete slump at point of placement as follows:
1. Ramps, slabs, and sloping surfaces: Not more than 3" prior to addition of superplasticizers.
2. Other concrete: No less than 3" and not more than 6".

G. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 1.

H. Vary mixing time to allow for effect of ambient temperature.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

D. Verify lines, levels and centers before proceeding with form work. Ensure dimensions agree with drawings.

3.2 REINFORCEMENT

A. Place, support and secure reinforcement against displacement.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.

C Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with 1/4 inch thick joint filler.

E Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

G Apply sealants in joint devices in accordance with Section 07900.

H Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

I Place concrete continuously between predetermined expansion, control, and construction joints.

J Do not interrupt successive placement; do not permit cold joints to occur.

K Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

L Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

M Install vapor retarder under interior slabs-on-grade. Lap joints minimum 6 inches and seal watertight by sealant applies between overlapping edges and ends.

N Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

3.4 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements as required.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.5 CONCRETE FINISHING

A Finish concrete floor surfaces in accordance with ACI 301.

B. Steel trowel surfaces which are scheduled to be exposed.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/8 inch per foot nominal.

3.6 CURING AND PROTECTION

A. Cure floor surfaces in accordance with ACI 308.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.7 FIELD QUALITY CONTROL

A. The Owner will engage a Testing Agency to perform material evaluation tests;
   1. Materials and installed work may require testing and retesting, as directed by the Architect, at anytime during the progress of work. Allow free access to material stockpiles and facilities. Testing and retesting of rejected materials shall be done at the Contractor's expense.

B. Sampling and testing for quality control, curing and placement of concrete shall include the following:
   1. Slump: ASTM C143; 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 C173; volumetric method for lightweight or normal weight concrete; one for each day's pour of each type of air entrained concrete.
   3. Concrete Temperature: Test hourly when air temperature is 40 degrees F and when 80 degrees F and above, and each time a set of compression test specimens made.
   4. Compression Test Specimen: ASTM C31. One set of 3 standard cylinders for each compressive strength test unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are required.
   5. Compressive Strength Tests: ASTM C39. One set for each day's pour exceeding 5 cu. yds. over and above the first 25 cu. yds. of concrete class placed in any one day; one specimen retained in reserve for later testing if required.

C. Test results will be reported in writing to the Architect/Engineer and the Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of the project identification name and number, date of concrete placement, name of concrete testing service, 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 7 day and 28 day tests.

3.8 PATCHING

A. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

B. Patch imperfections in accordance with ACI 301.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Rough carpentry and finish carpentry. Refer to Schedule located at the end of this Section.

B. Concealed wood blocking for support for accessories, etc.

C. Telephone and electrical panel backboards.

D. FRP Wall Panels – Toilet Rooms / Janitor Closet.

E. Exterior Metal Siding.

F. Miscellaneous items.

1.2 RELATED WORK

A. Section 092600 - Gypsum Board Systems.

B. Section 099000 - Painting.

C. Division 22 - Plumbing Fixtures.

D. Division 26 - Electrical.

1.3 REFERENCES

A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

B. APA: American Plywood Association.

C. AWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

D. NFPA: National Forest Products Association.

E. SPIB: Southern Pine Inspection Bureau.

F. WWPA: Western Wood Products Association.

G. NEMAL D3-1985: High pressure decorative laminates.

H. FSMMM-A-130- Adhesive, contact.

1.4 QUALITY ASSURANCE

A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).

B. When applicable, fabricate site made finish carpentry items in accordance with recommendations of Quality Standards of Architectural Woodwork Institute (AWI).

C. Perform work in accordance with the following agencies:
1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA.

1.5 COORDINATION

A. Coordinate layout installation of blocking and reinforcement in partitions for support.

B. Coordinate the work with plumbing and electrical rough-in.

PART 2 PRODUCTS

2.1 ROUGH CARPENTRY MATERIALS

A. Lumber: PS 20; graded in accordance with established Grading rules; maximum moisture content of 15% - 19%; of the following species and grades.
1. Non-Structural Light Framing and Blocking: Stress Group C; standard grade.

B. Nails, Spikes and Staples: Galvanized for exterior locations. high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application.

C. Anchor Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel; sized to suit application; galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.

D. Firestopping: Thermafiber mineral firesafing insulation as manufactured by US Gypsum Co. or approved equal.

E. Plywood: 3/4" thick; APA Rated sheathing, Structural 1, Grade C-D; Exposure Durability - 1; sanded (for use as telephone and electrical panel backboards).

2.2 WOOD TREATMENT

A. Wood Preservative Pressure Treatment: AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

B. Shop pressure treat and deliver to site ready for installation wood materials requiring pressure impregnated preservatives.

2.3 FRP WALL PANELS

A. Manufacturer: Glasteel.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.4 MATERIALS

A. Glasliner FRP wall panels; Series 1200; .090” thick; 4’ x 9’ sheets; smooth finish; color as selected by Architect.

B. Accessories: Inside corner, end cap, divider bar, outside corner, outside corner angle and nylon rivets; color as selected by Architect.

C. Adhesive: Fast Grab FRP adhesive or as recommended by panel manufacturer.

2.5 EXTERIOR METAL SIDING

A. Manufacturer: Atas International, Inc.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.6 MATERIALS

A. Design Wall; 12” wide; install full height in areas of replacement/infill; smooth panel WITHOUT stiffening ribs; interlocking panel; depth to match existing; .050” thick; color to be selected. **See Elevations for Locations.**

B. Accessories: Selected and as required for a complete installation from manufacturer’s full line of trims; color, gauge and finish to match siding.

C. Fluted Siding: To match existing profile and color; full height panels in areas of infill/replacement. **See Elevations for Locations.**

PART 3 EXECUTION

3.1 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

3.2 SCHEDULES

A. Rough Carpentry:
1. Behind Wall Wood Blocking for Support of Accessories.
2. Telephone and electrical panel backboards.

B. Interior Finish Carpentry:
1. FRP Wall Panels: Pre-finished with all required accessories; color selected by Architect – Toilet Rooms/Janitor Closet.

C. Exterior Finish Carpentry:
1. Metal Siding: Pre-finished; colors selected by Architect.

.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sound attenuating batt insulation in interior walls.

PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Certainteed Product - Unfaced sound attenuating batt insulation.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 MATERIALS

A. Sound Attenuating Batt Insulation: ASTM C665; preformed glass fiber batt roll type; unfaced.

B. Nails or Staples: Steel wire; electroplated; type and size to suit application.

C. Support Wire Fasteners: Galvanized rigid wire with pointed ends.

D Tape: Mesh reinforced, 2 inch wide.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install insulation in accordance with insulation manufacturer's instructions.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Tape, seal butt ends lapped flanges and tears or cuts in membrane.

3.2 SHEDULES

A. Interior Walls (Acoustical): 3-1/2" thick; unfaced; 16" wide.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fireproof firestopping and firesafing materials and accessories.

1.2 RELATED SECTIONS

A. Division 23 - Mechanical: Mechanical work requiring firesafing.

D. Division 26 - Electrical: Electrical work requiring firesafing.

1.3 REFERENCES

A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E119 - Method for Fire Tests of Building Construction and Materials.

C. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.

D. FM (Factory Mutual) - Fire Hazard Classifications.

E. UL - Fire Hazard Classifications.

F. UL 263 - Fire Tests of Building Construction and Materials.

G. UL 723 - Test for Surface Burning Characteristics of Building Materials.

H. UL 1479 - Fire Tests of Through-Penetration Firestops.

I. WH (Warnock Hersey) - Certification Listings.

1.4 DEFINITION

A. Firestopping (Firesafing): A sealing or stuffing material or assembly placed in spaces between building materials to arrest the movement of smoke, heat, gases, or fire through wall or floor openings.

1.5 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E119 and ASTM E814 to achieve a fire rating as noted on Drawings.

B. Firestop all interruptions to fire rated assemblies, materials and components.

1.6 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements.

B. Product Data: Provide data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS - FIRESAFING MATERIALS

A. United States Gypsum Co. Product: Thermafiber mineral firesafing insulation.

B. United States Gypsum Co. Product: Firecode Compound.

C. Substitutions: Under provisions of Section 01600.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

B. Installation Accessories: Galvanized steel safing impaling clips and other devices required to position and retain materials in place.

C. Water: Clean and potable.

2.3 FINISHES

A. Thermafiber Safing: Regular color, unfaced.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 1 - General Requirements.

B. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

C. Install damming materials to arrest liquid material leakage.

3.3 APPLICATION - SAFING INSULATION

A. Safing insulation to be nominal 6" thick or as indicated on drawings; install safing insulation recessed a minimum of 1" from the surface of the existing CMU/Wall Construction. Provide minimum 1" thick layer of fill material (Firecode Compound).

B. Cut safing ½" wider than opening to insure compression fit. Friction fit in the safe-off area to be protected.

C. For poke-through penetrations, install safing insulation in opening. Compress or install on wire hangers in all floor slab openings, to seal completely around telephone cables, ducts, piping or other utilities.

3.4 APPLICATION - FIRECODE COMPOUND

A. Mix compound in accordance with manufacturer's instructions.

B. Apply compound to a minimum of 1 inch thickness on top of safing insulation. Ensure that compound is in contact with all surfaces and that entire opening is filled with safing and compound.

C. For poke-through penetrations, trowel compound and work into penetrating opening.

3.5 CLEANING

A. Clean Work under provisions of Division 1 - General Requirements.

D. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1 - General Requirements.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-In-Place Concrete: Sealants required in conjunction with cast-in-place concrete.

B. Section 043000 - Unit Masonry System: Sealants required in conjunction with masonry.

C. Section 086100 - Wood Windows.

1.3 REFERENCES

A. ASTM C790 - Use of Latex Sealing Compounds.

B. ASTM C804 - Use of Solvent-Release Type Sealants.

C. ASTM C834 - Latex Sealing Compounds.

D. ASTM C920 - Elastomeric Joint Sealants.

E. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

F. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).

1.4 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

B. Samples: Submit two samples, illustrating sealant colors for selection.

C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 COORDINATION

A. Coordinate the work with all sections referencing this section.

PART 2 PRODUCTS

2.1 SEALANTS

	Location	Type	Color
A.	Door Frame/Walls	Acrylic, Latex	Paint to match
B.	Under Thresholds	Butyl Rubber	Black
C.	Doors & Windows to Metal Siding	Silicone Pecora 890 FTS	Selected by Architect
D.	Doors & Windows to Metal Trim	Silicone Pecora 890 FTS	Selected by Architect
E.	Metal Siding to Metal Trim	Silicone Pecora 890 FTS	Selected by Architect

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions.

D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation.

B. Protect sealants until cured.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated steel doors.

1.2 RELATED SECTIONS

A. Section 041000 - Mortar and Masonry Grout: Masonry mortar fill of metal frames.

B. Section 081120 - Standard Steel Frames.

C. Section 087100 - Door Hardware.

D. Section 099000 - Painting: Field painting of doors.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

B. ANSI/SDI-100 - Standard Steel Doors and Frames.

C. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM C236 - Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot-Box.

E. Door Hardware Institute (DHI) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements.

B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, cut-outs for glazing and finish.

C. Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Conform to requirements of ANSI/SDI-100 and ANSI A117.1.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division 1 - General Requirements.

B. Protect doors with resilient packaging sealed with heat shrunk plastic.

C. Accept doors on site in manufacturer's packaging. Inspect for damage.

D. Break seal on-site to permit ventilation.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.9 COORDINATION

A. Coordinate work under provisions of Division 1 - General Conditions.

B. Coordinate the work with door opening construction, door frame and door hardware installation.

PART 2 PRODUCTS

2.1 DOOR MANUFACTURERS

A. Pioneer Product: Series CHP.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 DOORS

A. Exterior (Non-rated): SDI-100, 18 gage, Grade II, Insulated with R-7 polystyrene core; flush door style M.

2.3 DOOR CONSTRUCTION

A. Face: Steel sheet in accordance with ANSI/SDI-100.

B. Core: Polystyrene.

C. Edges: Fully welded and ground smooth (seamless).

D. Continuous channel reinforcement - 14 gage full perimeter.

2.4 ACCESSORIES

A. Removable Stops: Rolled steel channel shape; mitered corners; prepared for countersunk type screws (18 gauge).

B. Primer: Zinc chromate type.

2.5 FABRICATION

A. Astragals for Double Doors: Steel, T shaped, specifically for double doors.

B. Fabricate doors with hardware reinforcement welded in place.

C. Close top and bottom edge of exterior doors with inverted steel channel closure. Seal joints watertight.

2.6 FINISH

A. Steel Sheet: Galvanized to ASTM A525, A60.

B. Primer: Air dried.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of Division 1 - General Requirements.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with ANSI/SDI-100 and DHI.

B. Install glazing in accordance with FGMA Glazing and Sealant Manuals.

C. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

D. Touch-up factory finished doors.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust work under provisions of Division 1 - General Requirements.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated and fire-rated steel door frames.

B. Non-rated and fire rated steel frames for borrowed/side lites.

1.2 RELATED SECTIONS

A. Section 060010 - Carpentry Work.

B. Section 082110 - Wood Doors.

C. Section 092600 - Gypsum Wall Board.

D. Section 099000 - Painting: Field painting of frames.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

B. ANSI/SDI-100 - Standard Steel Doors and Frames.

C. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

1.4 SUBMITTALS

A. Shop Drawings: Indicate frame elevations, reinforcement, and finish.

B. Product Data: Indicate frame configuration, anchor types and spacings, location of cut-outs for hardware, reinforcement.

C. Manufacturer's Installation Instructions: Indicate special installation instructions.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Conform to requirements of ANSI/SDI-100 and ANSI A117.1.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.9 COORDINATION

A. Coordinate the work with frame opening construction, door and hardware installation.

PART 2 PRODUCTS

2.1 FRAME MANUFACTURERS

A. Pioneer Product: Series F.

2.2 FRAMES

A. Interior Frames: 16 gage thick material, base metal thickness.

B. Exterior Frames: 14 gage thick material, bae metal thickness, galvanized.

2.3 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole.

B. Removable Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.

C. Primer: Baked enamel/zinc chromate type.

D. Frame Anchors: Wood stud frame anchors as required to suit application.

2.4 FABRICATION

A. Fabricate exterior frames as welded unit.

B. Fabricate interior frames for knock-down field assembly.

C. Fabricate frames with hardware reinforcement plates welded in place.

D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

E. Prepare frame for silencers. Provide three single silencers for single doors on strike side. Provide two single silencers on frame head at double doors without mullions.

F. Jamb depth as indicated on Drawings and to suit application.

2.5 FINISH

A. Steel Sheet: Cold rolled conforming to ASTM A366.

B. Primer: Baked / air dried.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with ANSI/SDI-100 and DHI.

B. Coordinate with metal stud framing and wallboard wall construction for anchor placement.

C. Coordinate installation of glass and glazing.

D. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08111.

E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

PART1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; non-rated and fire rated.

B. Wood and glass doors.

1.2 RELATED SECTIONS

A. Section 081120 - Standard Steel Frames.

B. Section 087120 - Door Hardware.

C. Section 088000 – Glazing.

1.3 REFERENCES

A. ANSI/HPMA HP - Hardwood and Decorative Plywood.

B. ASTM E413 - Classification for Determination of Sound Transmission Class.

C. AWI - Quality Standards of the Architectural Woodwork Institute.

1.4 SUBMITTALS

A. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, identify cutouts for hardware, glazing, etc.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; and factory machining criteria.

C. Samples: Submit two samples of door veneer, 4 x 4 inch in size illustrating wood grain, stain color, and sheen.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with AWI Quality Standard Section 1300, Premium Grade.

B. Finish doors in accordance with AWI Quality Standard Section 1500.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site.

B. Package, deliver and store doors in accordance with AWI Section 1300.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on-site to permit ventilation.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.9 COORDINATION

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.10 WARRANTY

A. Provide warranty.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Doors:
1. Marshfield Door Systems - Signature Series Wood Veneer Doors.
2. Substitutions: Under provisions of Division 1- General Requirements.

2.2 DOOR TYPES

A. Flush Interior Doors: 1-3/4" thick; solid core and hollow core construction; non-rated.

B. Flush Interior with Glazing: 1-3/4" thick; solid core construction; structural composite lumber; with factory cut openings as per drawings; Type W-8 Lite Moulding with 1/8" x 1/8" reveal.

2.3 DOOR CONSTRUCTION

A. Core: Solid, non-rated core, AWI, Section 1300.

B. Core: Hollow, AWI, Section 1300, Type SHC.

C. SRC-Stile and rail, particle core, bonded to stiles and rails.

2.4 DOOR FACING

A. Veneer Facing: AWI Custom quality, Premium White Birch; rotary sliced; pre-finished from manufacturer’s standard selection of Designer’s Finishes.

2.5 ADHESIVE

A. Facing Adhesive: Type II - water resistant.

2.6 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Vertical Exposed Edge of Stiles: Of same species as veneer facing. Hardwood for transparent finish facing.

C. Fit door edge trim to edge of stiles after applying veneer facing.

D. Bond edge banding to cores.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

2.7 FINISH

A. Factory finish; color to be selected by Architect.

2.8 GLAZING

A. Clear, tempered safety glass, 1/4" thick.

B. Clear tempered safety glass, impact and fire resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with AWI Quality Standards.

B. Trim door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

D. Pilot drill screw and bolt holes.

E. Machine cut for hardware. Core for handsets and cylinders.

F. Coordinate installation of doors with installation of frames.

G. Coordinate installation of glass and glazing.

3.3 INSTALLATION TOLERANCES

A. Conform to AWI requirements for fit and clearance tolerances.

B. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

3.4 ADJUSTING

A. Adjust door for smooth and balanced door movement.

3.5 SCHEDULE

A. See Drawings.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior aluminum doors and storefront entrance frames.

B. Fixed aluminum windows.

C. Perimeter sealant.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Door Hardware: Hardware items for aluminum and glass entry doors.

1.3 RELATED SECTIONS

A. Section 079000 - Sealants: System perimeter sealant and back-up materials.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.4 REFERENCES

A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. AAMA - Curtain Wall Manual #10 - Care and Handling of Architectural Aluminum from Shop to Site.

C. AAMA 606.1 - Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.

D. AAMA 605.2-92 - Specifications for High Performance Organic Coatings on Architectural Extrusions and Panels.

E. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.

F. ANSI A117.1 - Safety Standards for the Handicapped.

G. ANSI/ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

H. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

I. ANSI/ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.5 SYSTEM DESCRIPTION

A. Aluminum entrance and storefront system includes tubular aluminum sections, doors, shop fabricated, factory pre-finished, related flashings, anchorage and attachment

devices.

1.6 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as measured in accordance with ANSI/ASTM E330.

B. Limit mullion deflection to flexure limit of glass L/175; with full recovery of glazing materials.

C. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

D. Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with AAMA 501 and ANSI/ASTM E283.

E. Water Leakage: None, when measured in accordance with AAMA 501 with a test pressure difference of 15 lbf/sq ft.

F. Maintain continuous air and vapor barrier throughout assembly, primarily in line with pane of glass and heel bead of glazing compound.

G. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental affect to system components.

H. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.7 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work and expansion and contraction joint location and details.

C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass door hardware, and internal drainage details.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.8 QUALITY ASSURANCE

A Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B Conform to requirements of ANSI A117.1.

1.9 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1 - General Requirements.

B. Handle work of this section in accordance with AAMA - Curtain Wall Manual #10.

C. Protect pre-finished aluminum surfaces with wrapping or stripable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.12 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.13 COORDINATION

A. Coordinate Work under provisions of Division 1 - General Requirements.

1.14 WARRANTY

A. Provide three year warranty under provisions of Division 1 - General Requirements.

B. Warranty: Include coverage for complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kawneer Trifab 451T Storefront Framing System; center glazed; Series 350 Medium Stile Doors.

B. Accessories: As specified.

C. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B221.

B. Sheet Aluminum: ANSI/ASTM B209.

C. Fasteners: Stainless steel.

2.3 COMPONENTS (DOORS & FRAME/FIXED WINDOWS)

A. Frame: 2" x 4 ½" nominal; thermally broken; flush glazing stops; internal weep drainage system.

B. Intermediate mullion: 2"x 4½" nominal, thermally broken, flush glazing stops.

C. High Performance Sill Flashing: Compatible with system.

D. Doors: 1-3/4 inches thick, 3½ inch wide top rail, 3½ inch wide vertical stiles, 12 inch ADA base bottom rail; beveled glazing stops.

E. Flashings: .040 inch minimum, aluminum, finish to match mullion sections where exposed.

F. Storefront and Door Finish: Clear Anodized.

G. Thermal Flat Filler: Compatible with system; continuous.

H. Strap Anchor: Compatible with system.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08800.

2.5 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07900.

2.6 HARDWARE

A. See Hardware Schedule - Section 08710 for all door hardware sets or as described above.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement for door hardware.

F. Reinforce framing members as required for imposed loads.

2.8 FINISHES - KAWNEER ENTRANCE / FRAME / FIXED WINDOWS

A. Finish coatings: Conform to AA-M12C22A44; anodized aluminum; #14 - Clear; Architectural Class 1 - .7 mils aluminum.

B. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq ft.

C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site opening conditions under provisions of Division 1 - General Requirements.

B. Verify dimensions, tolerances, and method of attachment with other work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to provide permanent fastening to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install required flashings.

G. Set thresholds in bed of mastic and secure.

H. Install hardware using templates provided. Refer to Section 08712 for installation requirements.

I. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.

J. Install perimeter sealant to method required to achieve performance criteria.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of two adjoining members abutting in plane: 1/32 inch.

3.4 ADJUSTING

A. Adjust work under provisions of Division 1 - General Requirements.

B. Adjust operating hardware for smooth operation.

3.5 CLEANING

A. Clean work under provisions of Division 1 - General Requirements.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Division 1 - General Requirements.

B. Protect finished work from damage.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of door hardware for doors specified in "Hardware Sets" and required by actual conditions. Including screws, bolts, expansion shields, electrified door hardware, and other devices for proper application of hardware.

B. Where items of hardware are not specified and are required for intended service, such omission, error or other discrepancy to be submitted to Architect fourteen calendar days prior to bid date for clarification by addendum.

C. Products supplied but not installed under this Section:
   1. Hardware for aluminum doors will be furnished under this Section, but installed under Division 08 Openings
   2. Final replacement of cylinder cores to be installed by Owner.
   3. Electrified hardware will be furnished and installed under this Section, with connections by Cumberland County College's security vendor.

D. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

E. Related Divisions:
   1. Division 08 Openings
   2. Division 26 Electrical
   3. Division 28 Electronic Safety And Security

1.02 REFERENCES

A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
   1. ANSI/BHMA A156.1 Butts & Hinges (2006)
   2. ANSI/BHMA A156.2 Bored & Preassembled Locks & Latches (2011)
   3. ANSI/BHMA A156.3 Exit Devices (2014)
   4. ANSI/BHMA A156.4 Door Controls – Closers (2008)
   5. ANSI/BHMA A156.6 Architectural Door Trim (2010)
   6. ANSI/BHMA A156.7 Template Hinge Dimensions (2009)
   7. ANSI/BHMA A156.8 Door Controls – Overhead Stops and Holders (2010)
   8. ANSI/BHMA A156.16 Auxiliary Hardware (2008)
   9. ANSI/BHMA A156.18 Materials & Finishes (2006)
   10. ANSI/BHMA A156.21 Thresholds (2009)
   11. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
   12. ANSI/BHMA A156.25 Electrified Locks (2007)
   13. ANSI/BHMA A156.26 Continuous Hinges (2006)
   14. ANSI/BHMA A156.28 Keying Systems (2007)
   15. ANSI/BHMA A156.31 Electric Strikes (2007)
   16. ANSI/BHMA A156.36 Auxiliary Locks (2010)
   17. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames (2014)
   18. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames (2006)

B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:
   1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities 2009

2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Underwriters Laboratories, Inc. (UL):
   1. UL 10C Positive Pressure Fire Test of Door Assemblies
   2. UL 1784 Air Leakage Test of Door Assemblies
   3. UL/ULC Listed

D. Door and Hardware Institute (DHI):
   1. DHI Publication – Keying Systems and Nomenclature (1989)
   2. DHI Publication – Abbreviations and Symbols
   3. DHI Publication – Installation Guide for Doors and Hardware
   4. DHI Publication – Sequence and Format of Hardware Schedule (1996)

E. National Fire Protection Agency (NFPA)
   1. NFPA 70 National Electrical Code 2014
   2. NFPA 80 Standard for Fire Doors and Other Opening Protective's 2013
   3. NFPA 101 Life Safety Code 2015
   4. NFPA 105 Standard for the Installation of Smoke Door Assemblies 2013

F. Building Codes
   1. IBC International Building Code 2015
   2. Local Building Code

1.03 SUBMITTALS

A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements.

B. Shop Drawings:
   1. Organize hardware schedule organized in vertical format illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
   2. Include lock, latch or trim function (Entry, Classroom, Passage, etc.) in the product description under the Hardware Headings to matching the actual function as indicated by the product catalog number.
   3. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
   4. Architectural Hardware Consultant (AHC), as certified by DHI, who shall affix seal attesting to completeness and correctness, shall review hardware schedule prior to submittal.

C. Submit manufacturer's catalog sheet on design, grade and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide index, and cover sheet.

D. Coordination: Distribute door hardware templates to related divisions within fourteen days of receiving approved door hardware submittals.

E. Electrified Hardware: Provide electrical information to include voltage, and amperage requirements for electrified door hardware and description of operation.
   1. Description of operation for each electrified opening to include description of component functions including location, sequence of operation and interface with other building control systems.

2. Wiring Diagrams: Detail wiring for power, signal, and control system and differentiate between manufacturers installed and field installed wiring. Include the following:
   a. System schematic
   b. Point to point wiring diagram
   c. Riser diagram
   d. Elevation of each door
3. Detail interface between electrified door hardware and fire alarm, access control, security, and building control systems.
4. Provide junction boxes, relays and terminal blocks as needed for proper door operations and connections.

F. Upon door hardware submittal approval, furnish for each electrified opening, three copies of point to point diagrams.

G. Closeout Submittals: Submit to Owner in a three ringed binder or CD if requested.
   1. Warranties.
   2. Maintenance and operating manual.
   3. Maintenance service agreement.
   4. Record documents.
   5. Copy of approved hardware schedule.
   6. Copy of approved keying schedule with bitting list.
   7. Door hardware supplier name, phone number and fax number.

1.04 QUALITY ASSURANCE

A. Listed and Labeled electrified door hardware as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction.

B. Hardware supplier shall employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who shall be available at reasonable times during course of work for Project hardware consultation.
   1. Electrified Door Hardware Supplier Qualifications: Experienced door hardware supplier who has completed projects with electrified door hardware 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.

C. Door hardware conforming to ICC/ANSI A117.1. : Handles, Pulls, Latches, Locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

D. Fire Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and or labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C, unless otherwise indicated.

E. Fire Door Inspection: Prior to receiving certificate of occupancy have fire rated doors inspected by an independent certified Fire and Egress Door Assembly Inspector (FDAI), as certified by Intertek (ITS), a written report shall be submitted to Owner and Contractor. Doors failing inspection shall be adjusted, replaced or modified to be within appropriate code requirements.
   Use for buildings under IBC 2009

F. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

G. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.

H. Substitution request: Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design function and quality. Approval of request is at the discretion of the owner, architect and their designated consultants.

I. Pre-installation Meeting: Comply with requirements in Division 1 Section "Project Meetings."
   1. Convene meeting seven days before installation. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant and fire alarm consultant.
   2. Include in conference decisions regarding proper installation methods and procedures for receiving and handling hardware.
   3. Review sequence of operation for each type of electrified door hardware, inspect, and discuss electrical roughing-in and other preparatory work performed by other trades.
   4. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

I. Within fourteen days of receipt of approved door hardware submittals contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owners instructions.

J. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.

K. Hardware listed in 3.07- Hardware Schedule is intended to establish type and grade.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed.

B. Furnish hardware with each unit marked and numbered in accordance with approved finish hardware schedule. Include door and item number for each type of hardware.

C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.

D. Deliver permanent key, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to Owner shall be established at "Keying Conference."

E. Waste Management and Disposal: Separate waste materials for reuse or recycling in accordance with Division 1.

1.06 WARRANTY

A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrent with other warranties made by Contractor under requirements of the Contract documents.

B. Special Warranty: Warranties specified in this article shall not deprive Owner of other rights. .
   1. Ten years for manual door closers.
   2. Five years for mortise, auxiliary and bored locks.
   3. Five years for exit devices.
   4. One year for electromechanical door hardware.

C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse and failure to exercise normal maintenance.

D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 – PRODUCTS

2.01 HINGES

A. Hinges, electric hinges of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Products to be certified and listed by the following:
   1. Butts and Hinges: ANSI/BHMA A156.1
   2. Template Hinge Dimensions: ANSI/BHMA A156.7

C. Butt Hinges:
   1. Hinge weight and size unless otherwise indicated in hardware sets:
      a. Doors up to 36" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .134" and a minimum of 4-1/2" in height.
      b. Doors from 36" wide up to 42" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .145" and a minimum of 4-1/2"" in height.
      c. For doors from 42" wide up to 48" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
      d. Doors greater than 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
      e. Width of hinge is to be minimum required to clear surrounding trim.

   2. Base material unless otherwise indicated in hardware sets:
      a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
      b. Interior Doors: Steel material.
      c. Fire Rated Doors: Steel or 304 Stainless Steel materials.
      d. Stainless Steel ball bearing hinges to have stainless steel ball bearings. Steel ball bearings are unacceptable.

   3. Quantity of hinges per door unless otherwise stated in hardware sets:
      a. Doors up to 60"in height provide 2 hinges.
      b. Doors 60" up to 90" in height provide 3 hinges.
      c. Doors 90" up to 120" in height provide 4 hinges.

d. Doors over 120” in height add 1 additional hinge per each additional 30” in height.
e. Dutch doors provide 4 hinges.

4. Hinge design and options unless otherwise indicated in hardware sets:
   a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
   b. Out-swinging exterior and out-swinging access controlled doors shall have non-removable pins (NRP) to prevent removal of pin while door is in closed position.
   c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
   d. Electric Through Wire (ETW) to have appropriate number of wires to transfer power through door frame to door for proper connection of finish hardware and certified to handle an amperage rating of 3.5AMPS/continuous duty with 16.0AMPS/intermittent duty.
   e. Provide mortar boxes for frames that require any electrically modified hinges if not an integral part of frame.
   f. When shims are necessary to correct frame or door irregularities, provide metal shims only.

5. Acceptable Manufacturers:

		Standard Weight	Heavy Weight
a.	Hager Companies	BB1279/BB1191	BB1168/BB1199
b.	Bommer	BB5000/BB5002	BB5004/BB5006
c.	McKinney	TA2714/TA2314	T4A3786/T4A3386

2.02 CONTINUOUS HINGES

A. Continuous hinges of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Products to be certified and listed by the following: Continuous Hinges: ANSI/BHMA A156.26 Grade 1

C. Continuous Geared Hinges:
   1. Determine model number by door and frame application, door thickness, frequency of use, and fire rating requirements according to manufacturer’s recommendations.
      a. Length of hinge shall be 1” less door height unless otherwise stated in hardware sets.

D. Material and Design:
   1. Base material: Anodized aluminum manufactured from 6063-T6 material, unexposed working metal surfaces shall be coated with TFE dry lubricant
   2. Bearings:
      a. Vertical loads shall be carried on Lubriloy RL bearings for non Fire Rated doors.
      b. Continuous hinges shall have a minimum spacing between bearings of 2-9/16”. Typical door from 80” to 84” in height to have a minimum of 32 bearings.
   3. Options:
      a. Removable Electric Through-Wire (RETW) shall have appropriate number of wires to transfer power through door frame to door for proper connection of finish hardware. Provide RETW in a form that can be removed for connection, servicing without removing entire hinge from door and frame, and certified to handle an amperage rating of 3.5AMPS/continuous duty with 16.0AMPS/intermittent duty.

b. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
c. Fire rated hinges shall carry UL certification, up to and including 90-minute applications for wood doors and up to 3-hour applications for metal doors.

E. Acceptable Manufacturers:

	Heavy Duty
1. Hager Companies	780-224HD
2. Bommer	FM120HD
3. Zero	914A

2.03 FLUSH BOLTS AND COORDINATORS

A. Flushbolts of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: Auxiliary Hardware: ANSI/BHMA A156.16

C. Labeled openings: Provide automatic or constant latching flush bolts per hardware schedule for inactive leaf of pairs of doors. Provide dust proof strikes for bottom bolt.

D. Non-Labeled openings: Provide two flush bolts for inactive leaf of pairs of doors per hardware schedule. Top bolt shall not be more than 78” centerline from floor. Provide dust proof strike for bottom bolt.

E. Acceptable Manufacturers:

	Manual Flush Bolt	Auto Flush Bolt	Dust Proof Strike
1. Hager Companies	282D	292D/295W/296W	280X
2. Rockwood	555	1942	570
3. Trimco	3917	3815	3911

F. Coordinators: Provide for labeled pairs of doors with automatic flush bolts or with vertical rod exit device with a mortise-locking device per hardware schedule. Provide filler piece to extend full width of stop on frame. Provide mounting brackets for closers and special preparation for latches where applicable.

G. Acceptable Manufacturers:

	Coordinator	Bracket	Bracket for stops greater than 2-1/4”
1. Hager Companies	297	297M	297N
2. Rockwood	1600	1601AB	1601C
3. Trimco	3094	3095	3096

2.04 REMOVABLE MULLIONS

A. Keyed and non-keyed removable mullions of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: UL/cUL/Warnock Hersey for fire rated pairs of doors up to 8 feet tall x 8 feet wide opening.

C. Material and Design:
   1. For use with rim exit devices on non-rated and fire rated pairs of doors. Mullion 2”x 3”x 11 gage steel tube.
   2. Top Fitting:
      a. Mullion locked in place without use of a key.
      b. Deadlock on fire rated device

D. Acceptable manufacturers for keyed removable mullions:

		Keyed Fire Rated	Keyed Non-Fire Rated
1.	Hager Companies:	4900TF	4900T
2.	Von Duprin:	KR9954	KR4954
3.	Sargent:	12- L980	L980S

E. Acceptable manufacturers for removable mullions:

		Fire Rated	Non-Fire Rated
4.	Hager Companies:	4900UF	4900U
5.	Von Duprin:	9954	4954
6.	Sargent:	12- 980	980S

2.05 LOCKS AND LATCHES (GRADE 1 CYLINDRICAL)

A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Product to be certified and listed by following:
   1. ANSI/BHMA A156.2 Series 4000 Certified to Grade 1.
   2. ANSI/BHMA A250.13 Certified for a minimum design load of 1150lbf (100psf) for single out swinging doors measuring 36” in width and 84” in height and a minimum design load of 1150lbf (70psf) for out swinging single doors measuring 48” in width and 84” in height.
   3. UL/cUL Labeled and listed for functions up to 3 hours for single doors up to 48” in width and up to 96” in height.
   4. UL10C/UBC 7-2 Positive Pressure Rated.
   5. ICC/ANSI A117.1.

C. Lock and latch function numbers and descriptions of manufactures series as listed in hardware sets.

D. Material and Design:
   1. Lock and Latch chassis to be Zinc dichromate for corrosion resistance.
   2. Keyed functions to be of a freewheeling design to help resists against vandalism.
   3. Non-handed, field reversible.
   4. Thru-bolt mounting with no exposed screws.
   5. Levers, Zinc cast and plated to match finish designation in hardware sets.
   6. Roses, wrought Brass or Stainless Steel material.

E. Latch and Strike:
   1. Stainless Steel latch bolt with minimum of ½” throw and deadlocking for keyed and exterior functions. Provide ¾” latchbolt for pairs of fire rated doors where required by door manufacture. Standard backset to be 2-3/4” and adjustable faceplate to accommodate a square edge door or a standard 1/8” beveled edge door.
   2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4” x 4-7/8” with proper lip length to protect surrounding trim.

F. Acceptable Manufacturers:
   1. Schlage: ND Series. No substitution

2.06 EXIT DEVICES (GRADE 1)

A. Exit Devices of one manufacturer as listed for continuity of design and consideration of warranty. Touch pad type, finish to match balance of door hardware

B. Standards: Manufacturer to be certified and or listed by the following:
   1. BHMA Certified ANSI A156.3 Grade 1
   2. UL/cUL Listed for up to 3 hours for "A" labeled doors
   3. UL10C/UBC 7-2 Positive Pressure Rated
   4. UL10B Neutral Pressure Rated
   5. UL 305Listed for Panic Hardware

C. Material and Design:
   1. Touch pad shall extend a minimum of one half-door width. Freewheeling lever design shall match design of locks levers. Exit device to mount flush with door.
   2. Latchbolts:
      a. Rim device – ¾" throw, Pullman type with automatic dead-latching, stainless steel
      b. Surface vertical rod device – Top ½" throw, Pullman type with automatic dead-latching, stainless steel. Bottom ½" throw, Pullman type, held retracted during door swing, stainless steel.
   3. Fasteners: Wood screws, machine screws and thru-bolts.

D. Lock and Latch Functions: Function numbers and descriptions of manufacturer's series and lever styles indicated in door hardware sets.

E. Acceptable Manufacturers:
   1. Hager Companies: 4500 Series/4600 Series
   2. Von Duprin: 99 Series/ 33 series

F. Electric Modifications:
   1. Motorized Electric Latch Retraction: Continuous duty solenoids retract the latch bolt for momentary or maintained periods of time.
   2. Provide Request to Exit (REX) switches as scheduled.

2.07 CYLINDERS AND KEYING

A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer shall meet the following:
   1. Auxiliary Locks: ANSI/BHMA A156.5
   2. DHI Handbook "Keying systems and nomenclature" (1989)

C. Cylinders:
   1. Manufacturer's standard tumbler type, large format IC core supported by Schlage Everest.
   2. Furnish with cams/tailpieces as required for locking device that is being furnished for project.

D. Keying:
   1. Conduct a keying meeting the owner's representative, to establish their requirements.

2. Copy of Owners approved keying schedule submitted to Owner and Architect with documentation of which keying conference was held and Owners sign-off.
3. Provide a bitting list to Owner of combinations as established, and expand to twenty five percent for future use or as directed by Owner.
4. Key into Owner's existing keying system Everest System (Campus Standard).
5. Keys to be shipped to Owner's representative, individually tag per keying conference.
6. Provide visual key control identification on keys.
7. Provide interchangeable cores with construction cores as required per hardware schedule.

E. Acceptable manufacturers:
1. Schlage Large Format Interchangeable core under Everest System – No substitution

2.08 PUSH/PULL PLATES

A. Push/Pull plates and bars of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be certified by the following:
1. Architectural Door Trim: ANSI/BHMA A156.6
2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Push plates: .050" thick, square corner and beveled edges with counter sunk screw holes. Width and height as stated in hardware sets.

D. Acceptable Manufacturers:
1. Hager Companies: 30S
2. Trimco

E. Pull plates: .050" thick, square corner and beveled edges. Width and height as stated in hardware sets, ¾" diameter pull, with clearance of 2-1/2" from face of door.

F. Acceptable Manufacturers:
1. Hager Companies: 33E
2. Trimco

G. Off-Set Pull: Hager 11J

2.09 CLOSERS (CAST IRON BODY GRADE 1)

A. Closers of one manufacturer as listed for continuity of design and consideration of warranty. Unless otherwise indicated on hardware schedule, comply with manufacturer's recommendation for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirements, and fire rating.

B. Standards: Manufacturer to be certified and or listed by the following:
1. BHMA Certified ANSI A156.4 Grade 1
2. ADA Compliant ANSI A117.1
3. UL/cUL Listed up to 3 hours.
4. UL10C Positive Pressure Rated
5. UL10B Neutral Pressure Rated

C. Material and Design:
1. Provide cast iron non-handed bodies with full plastic covers.

2. Closers shall have separate staked adjustable valve screws for latch speed, sweep speed, and backcheck.
3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
4. One-piece seamless steel spring tube sealed in hydraulic fluid.
5. Double heat-treated steel tempered springs.
6. Precision-machined heat-treated steel piston.
7. Triple heat-treated steel spindle.
8. Full rack and pinion operation.

D. Mounting:
1. Out swing doors use surface parallel arm mount closers except where noted on hardware schedule.
2. In swing doors use surface regular arm mount closers except where noted on hardware schedule.
3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADDAG). Comply with following maximum opening force requirements.
1. Interior hinged openings: 5.0 lbs.
2. Fire rated and exterior openings use minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-reaming and self-tapping wood and machine screws and sex nuts and bolts for each closer.

G. Acceptable manufacturers:
1. Hager Companies: 5100 Series
2. Sargent: LCN 4000 Series

2.10 PROTECTIVE TRIM

A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.

B. Size of protection plate: Single doors, size two inches less door width (LDW) on push side of door, and one inch less on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and ½ inch on pull side of door.
1. Kickplates 10” high or sized to door bottom rail height

C. Standards: Manufacturer shall meet requirements for:
1. Architectural Door Trim: ANSI/BHMA A156.6
2. UL

D. Material and Design:
1. 0.050” gage stainless steel
2. Corners square, polishing lines or dominant direction of surface pattern shall run across door width of plate.
3. Bevel top, bottom and sides uniformly leaving no sharp edges.
4. Provide countersink holes for screws for all protection plates. Screws holes shall be spaced equidistant eight inches CTC, along a centerline not over ½ inch in from edge around plate. End screws maximum of 0.53 inch from corners.

E. UL label stamp required on protection plates when top of plate is more than 16 inches above bottom of door on fire rated openings. Verify door manufactures UL listing for maximum height and width of protection plate to be used.

F. Acceptable Manufacturers:
   1. Hager Companies: 190S
   2. Trimco
   3. Burns

2.11 STOPS AND HOLDERS

A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Wall Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Provide wall stops when possible. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.

C. Standards: Manufacturer shall meet requirements for:
   1. Auxiliary Hardware: ANSI/BHMA A156.16

D. Acceptable Manufacturers:

	Convex	Concave
1. Hager Companies	232W	236W
3. Burns		

E. Overhead Stops and Holders: Provide overhead stop and holders for doors that open against equipment, casework sidelights and other objects that would make wall stops/holders and floor stops/holders inappropriate. Provide sex bolt attachments for mineral core wood door applications.

F. Standards: Manufacturer shall be certified by the following:
   1. Overhead Stops and Holders: ANSI/BHMA A156.8 Grade 1

G. Acceptable Manufacturers:

	Heavy Duty Surface	Heavy Duty Concealed
1. Hager Companies	7000 SRF Series	7000 CON Series
2. Glynn Johnson	90 Series	100 Series
3. Sargent	590 Series	

2.12 POWER SUPPLY (for fail safe or fail secure locking devices)

A. Power supplies of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer shall meet requirements for:
   1. UL Listed

C. Design:
   1. Interface with building alarm controls, card readers, keypads, and other door controls.
   2. Filtered and regulated 24 VDC constant voltage
   3. 2 AMP load capacity
   4. Over voltage/short circuit protection

5. Surge protection for locking devices
6. Interface relay
7. Adjustable time delay

D. Acceptable Manufacturer:
   1. Hager Companies 2903

2.13 DOOR GASKETING AND WEATHERSTRIP

A. Door gasketing and weather-strip of one manufacturer as listed for continuity of design and consideration of warranty.

B. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide non-corrosive fasteners for exterior applications.
   1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
   2. Meeting stile gasketing: Fasten to meeting stiles, forming seal when doors are in closed position.
   3. Door bottoms: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
   4. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
   5. Drip Guard: Apply to exterior face of frame header. Lip length to extend 4” beyond width of door.

C. Standards: Manufacturer shall meet requirements for:
   1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22
   2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing. (721)

D. Smoke-Labeled Gasketing: Comply with NFPA 105 listed, labeled, and acceptable to authorities having jurisdiction, for smoke control indicated.
   1. Provide smoke labeled gasketing on 20-minute rated doors and on smoke rated doors.

E. Fire-Rated Gasketing: Comply with NFPA 80 listed, labeled, and acceptable to Authorities Having Jurisdiction, for fire ratings indicated.

F. Refer to Section 08 1416 Wood Doors for Category A or Category B. Comply with UBC 7-2 and UL10C positive pressure where frame applied intumescent seals are required. Provide Hager # 720 for single and 720 x 724 for a pair of doors.

G. Acceptable Manufacturers:
   1. Perimeter Gasketing:

	Adhesive Applied	Stop Applied
a. Hager Companies:	726	881S
b. K.N. Crowder:		
c. Reese:		

   2. Meeting Stile Weatherstrip:
      a. Hager Companies: 872SN
      b. K.N. Crowder:
      c. Reese:

   3. Door Bottom Sweeps:
      a. Hager Companies: 770S

b. K.N. Crowder:
c. Reese:

4. Overhead Drip Guard
   a. Hager Companies: 810S
   b. K.N. Crowder:
   c. Reese:

2.14 THRESHOLDS

A. Thresholds of one manufacturer as listed for continuity of design and consideration of warranty.

B. Set thresholds for exterior and acoustical openings in full bed of sealant with lead expansion shields and stainless-steel machine screws complying with requirements specified in Division 7 Section “Joint Sealants”. Notched in field to fit frame by hardware installer. Refer to Drawings for special details.

C. Standards: Manufacturer to be certified by the following:
   1. Thresholds: ANSI/BHMA A156.21
   2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

D. Acceptable Manufacturers:
   1. Hager Companies: 412S
   2. K.N. Crowder
   3. Reese

2.59 SILENCERS

A. Where smoke, light, or weather seal are not required, provide three silencers per single door frame, two per double door frame and four per Dutch door frame.

B. Standards: Manufacturer shall meet requirements for:
   1. Auxiliary Hardware: ANSI/BHMA A156.16

C. Acceptable Manufacturers:

	Hollow Metal Frame	Wood Frame
1. Hager Companies:	307D	308D
2. Rockwood:		
3. Trimco:		

2.63 FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within 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 range of approved Samples.

B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install hardware per manufacturer's instructions and in compliance with:
1. NFPA 80.
2. NFPA 105.
3. ICC/ANSI A117.1.
4. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
5. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames
6. DHI Publication – Installation Guide for Doors and Hardware
7. UL10C/UBC7-2
8. Local building code.
9. Approved shop drawings.
10. Approved finish hardware schedule.

B. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

3.03 FIELD QUALITY CONTROL

A. Material supplier to schedule final walk through to inspect hardware installation ten business days before final acceptance of Owner. Material supplier shall provide a written report detailing discrepancies of each opening to General Contractor within seven calendar days of walk through.

3.04 ADJUSTMENT, CLEANING AND DEMONSTRATING

A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.

B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.

C. Demonstration: Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finished hardware to be turned over and explained usage at this meeting.

3.05 PROTECTION

A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts Project as complete.

3.06 HARDWARE SET SCHEDULE

A. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.

B. Hardware schedule does not reflect handing, backset, method of fastening and like characteristics of door hardware and door operation.

C. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE

Set #1

Door Numbers: 100-1
Each opening to receive:

Qty.	Type	Description	Finish	
1 ea.	Continuous Hinge	780-226HD	Clear	HAG
1 ea.	Electrified Continuous Hinge	780-226HD RETW	Clear	HAG
1 ea.	Panic Exit Device	4601 RIM	US32D	HAG
1 ea.	Motor latch Retracted Panic Exit	4601 RIM MLR	US32D	HAG
1 ea.	Rim Cylinder (night latch)	Match Campus standard		
	US26D SCH			
2 ea.	Off-set Pulls	11J	US32D	HAG
1 ea.	Keyed Removable Mullion	4900T	USP	HAG
1 ea.	Rim Cylinder (KRM)	Match Campus standard FSIC	US26D	SCH
2 ea.	Final keyed cores	Match Campus Standard FSIC		US26D
	SCH			
2 ea.	Closers	5100 HDCS	ALM	HAG
2 ea.	Drop Plates	5110 (as required)	ALM	HAG
2 ea.	Blade Stop Spacer	5113 (as required)	ALM	HAG
1 ea.	Threshold	412S door opening width		MIL
	HAG			
1 ea.	Power Supply	2903	-	HAG
1 ea.	Door Position Switch	By CCC security vendor	-	-
1 ea.	Card Reader	By CCC security vendor	-	-

Weather-strip and sweeps by door manufacturer.
120VAC power, conduit and wiring by Division 26.
Description of Operation: Doors normally closed and locked. Key retracts latch. Removing key leaves the door locked. Access upon proper credential validation. In the event of a power failure the door remains locked (Fail Secure). Free egress at all times.
Special Note: Allow for longer rim cylinder tail pieces and longer fasteners to accommodate the 2" thick doors.

Set #2

Door Numbers: 100-2, 105-1, 112-1
Each opening to receive:

Qty.	Type	Description	Finish	
6 ea.	Hinges	BB1279 4.5” x 4.5” NRP	US26D	HAG
2 set	Automatic Flush Bolts	296W	US26D	HAG
1 ea.	Classroom Security Lock	ND75 SPA FSIC		
	US26D SCH			
2 ea.	Final keyed cores	Match Campus Standard FSIC		US26D
	SCH			
2 ea.	Hold Open Closer	5100 HDHOCS	ALM	HAG
1 ea.	Coordinator	297D	USP	HAG
2 ea.	Closer Mounting Brackets	297M/N		USP
	HAG			
2 ea.	Kick Plates	190S 10” x 1” LDW	US32D	HAG
2 ea.	Silencers	307D	Gray	HAG
1 set	Metal Edge and Astragal	By wood door mfg. as required		-
-				

Set #3

Door Numbers: 101-1, 104-1
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Push Plate	30S 4” x 16”	US32D	HAG
1 ea.	Pull Plate	33E 4” x 16”	US32D	HAG
1 ea.	Closer	5100 MLT	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
3 ea.	Silencers	307D	Gray	HAG

Set #4

Door Numbers: 102-1, 103-1
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Storeroom Lock	ND80 SPA FSIC		US26D
	SCH			
1 ea.	Final keyed cores	Match Campus Standard FSIC		US26D
	SCH			
1 ea.	Closer	5100 MLT (102-1)	ALM	HAG
1 ea.	Hold Open Closer	5100 HOTA (103-1)	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W (102-1)	US32D	HAG
3 ea.	Silencers	307D	Gray	HAG

Set #5

Door Numbers: 107-1
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Office Lock SCH	ND50 SPA FSIC		US26D
1 ea.	Final keyed cores SCH	Match Campus Standard FSIC		US26D
1 ea.	Hold Open Closer	5100 HOTA	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Gasket	726 head and jambs	Char	HAG

Set #6

Door Numbers: 108-1, 113-1
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Classroom Security Lock US26D SCH	ND75 SPA FSIC		
2 ea.	Final keyed cores SCH	Match Campus Standard FSIC		US26D
1 ea.	Closer	5100 MLT	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Wall Stop	236W	US32D	HAG
1 ea.	Gasket	726 head and jambs	Char	HAG

Set #7

Door Numbers: 109-1, 110-2
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Classroom Security Lock US26D SCH	ND75 SPA FSIC		
2 ea.	Final keyed cores SCH	Match Campus Standard FSIC		US26D
1 ea.	Closer	5100 HDCS	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Gasket	726 head and jambs	Char	HAG

Set #8

Door Numbers: 110-1
Each opening to receive:

Qty.	Type	Description	Finish	
3 ea.	Hinges	BB1279 4.5” x 4.5”	US26D	HAG
1 ea.	Panic Exit Device	4501 RIM Exit Only	US32D	HAG
1 ea.	Closer	5100 HDCS	ALM	HAG
1 ea.	Kick Plate	190S 10” x 2” LDW	US32D	HAG
1 ea.	Threshold	412S door width		MIL
	HAG			
1 ea.	Gasket	726 head and jambs	Char	HAG
1 ea.	Sweep	770S B door width	MIL	HAG
1 ea.	Drip Cap	810S door width + 4”	MIL	HAG
1 ea.	Door Position Switch	By CCC security vendor	-	-

Set #9

Door Numbers: 112-2
Each opening to receive:

Qty.	Type	Description	Finish	
Re-use existing, relocated overhead coiling door and hardware.				
1 ea.	Door Position Switch	By CCC security vendor	-	-

Set #10

Door Numbers: Existing Exterior Doors
Each opening to receive:

Qty.	Type	Description	Finish	
1 ea.	Door Position Switch	By CCC security vendor	-	-

Set #11

Door Numbers: General
Each opening to receive:

Qty.	Type	Description	Finish	
18 ea.	Temporary construction cores	Schlage FSIC with control & operational keys	-	SCH

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for doors, sidelites and storefronts.

B. Window film for existing display case windows.

1.2 RELATED SECTIONS

A. Section 079000 - Joint Sealers: Sealant and back-up material.

B. Section 081110 - Standard Steel Doors.

C. Section 081120 - Standard Steel Frames.

D. Section 082110 - Wood Doors.

E. Section 084100 - Aluminum Entrances and Storefronts.

1.3 REFERENCES

A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. ASTM C1036 - Flat Glass.

D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

E. FGMA - Glazing Manual.

F. FGMA - Sealant Manual.

G. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.

H. FS TT-S-00230 - Sealing Compounds, Synthetic-Rubber Base, Single Component, Chemically Curing.

I. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.

J. Laminators Safety Glass Association - Standards Manual.

1.4 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials of this Section shall provide continuity of building enclosure vapor and air barrier:
   1. In conjunction with materials described in Section 07900.
   2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with applicable code in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.5 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Manufacturer's Installation Instructions: Indicate special precautions required.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual FGMA Sealant Manual for glazing installation methods.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop Drawings.

1.9 COORDINATION

A. Coordinate Work under provisions of Division 1 - General Requirements.

B. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.10 WARRANTY

A. Provide five year manufacturer's warranty under provisions of Division 1 - General Requirements.

B. Warranty: Include coverage for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.1 MANUFACTURERS - FLAT GLASS MATERIALS

A. Pittsburgh Plate Glass.

B. Safti First (Rated glazing)

C. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 FLAT GLASS MATERIALS

A. Insulated Glass: ASTM E774 and ASTM E773; double pane with glass elastomer edge seal; outer pane of ¼" clear annealed glass and interior pane of ¼" clear annealed glass; purge interior space with dry hermetic air; total unit thickness of 1" minimum; **Type G-1**.

B. Insulated Safety Glass: ASTM E774 and ASTM E773; double pane with glass elastomer edge seal; outer pane of ¼" tempered clear glass; purge intepane space with dry hermetic air; total unit thickness of 1" minimum; **Type G-2**.

C. Safety Glass: Clear, fully tempered with horizontal tempering conforming to ANSI Z97.1; 1/4 inch thick; **Type G-3.**

D. 20 Minute Rated Clear Tempered Glass: Safti First Super Lite I; **Type G-4.**

E. 45 Minute Rated Clear Glass: Safti First Super Lite II-XL-45; inboard/outboard tempered lites protecting a fire resistive intumescent layer; **Type G-5.**

2.3 GLAZING COMPOUNDS

A. Acrylic Sealant: FS TT-S-00230, Type II, Class A; single component; cured Shore A hardness of 15- 25 non-bleeding color as selected.

2.4 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene 80 - 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene 50 - 60 Shore A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared openings under provisions of Division 1 - General Requirements.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

3.3 INTERIOR - DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.4 EXTERIOR - WET/DRY METHOD

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with sealant.

B. Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corner.

D. Rest glazing on setting blocks and push against tape and heel bead of seanant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line.

F. Fill gap between glazing stop with sealant to depth equal to bite of grame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 CLEANING

A. Clean work under provisions of Division 1 - General Requirements.

B. Remove glazing materials from finish surfaces.

C. Remove labels after work is complete.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1 - General Requirements.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal stud wall framing and furring.

B. Gypsum Board – Rated and non-rated.

C. Taped and sanded joint treatment.

D. Accessories.

1.2 RELATED SECTIONS

A. Section 060010 - Carpentry.

B. Section 081120 - Standard Steel Frames.

C. Section 099000 - Painting: Surface finish.

D. Division 23 - Mechanical.

C. Division 26 - Electrical.

1.3 REFERENCES

A. ASTM C36 - Gypsum Wallboard.

B. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

C. ASTM C630 - Water Resistant Gypsum Backing Board.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840 and GA-600.

1.5 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum 3 years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS - GYPSUM BOARD SYSTEM

A. Georgia-Pacific Gypsum Products.

B. USG Corporation.

C. Substitutions: Under provisions of Division 1 – General Requirements.

2.2 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; ½" thick, maximum permissible length; ends square cut, tapered edges.

B. Moisture Rated Gypsum Board: ASTM 630, ½" thick, maximum permissible length; ends square cut, tapered edges.

C. Fire Rated Gypsum Board: ASTM C36, 5/8" thick, Type 'X'; maximum permissible length; ends square cut, tapered edges.

2.3 FRAMING MATERIALS

A. Studs and Tracks - Interior Partitions: ASTM C645; galvanized sheet steel, 3-5/8" and 6", 20 gage thick, C shape with knurled faces.

B. Joists-Interior Ceilings/Soffits: ASTM C645; galvanized sheet steel, 3 5/8 or 6", 20 gage thick, C shape with knurled faces.

C. Stud Furring-Interior Walls: ASTM C645; galvanized sheet steel; 1-1/2", 25 gage thick hat channels or 2 1/2", 22 gage thick studs.

D. Vertical Slide Clip: Galvanized sheet steel, 12 gage thick.

E. Fasteners: ASTM C514.

F. Anchorage to Substrate: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

G. Adhesive: ASTM C557.

2.4 ACCESSORIES

A. Corner Beads: Metal.

B. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

C. Fasteners: ASTM C1002.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201, GA-216 and GA-600.

B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing. At rated partitions; install in accordance with approved assembly.

C. Use screws when fastening gypsum board to wood stud or framing.

D. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

E. Remove and redo defective work.

F. Install ⅝" thick gypsum fire rated gypsum wallboard where indicated on Drawings.

3.3 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.4 METAL STUD INSTALLATION

A. Install studs in accordance with ASTM C754, and manufacturer's instructions.

B. Metal Stud Spacing: 16 inches and 24 inches on center, as indicated on drawings.

C. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.

D. Blocking: Screw fire retardant treated wood blocking and steel channels to studs. Install blocking for support of wall cabinets, hardware, and other items.

3.5 CEILING/SOFFIT FRAMING

A. Install C Sections in accordance with ASTM C754 and manufacturer’s instructions.

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical tile.

1.2 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

C. ASTM E1264 - Classification of Acoustical Ceiling Products.

D. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

1.3 SYSTEM DESCRIPTION

A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements.

B. Product Data: Provide data on metal grid system components and acoustical units.

C. Samples: Submit two samples full size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, of suspension system main runner, cross runner, and edge trim.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALIFICATIONS

A. Grid Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable codes for combustibility requirements for materials.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.8 SEQUENCING

A. Sequence work under the provisions of Division 1 - General Requirements.

B. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

C. Install acoustical units after interior wet work is dry.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Division 1 - General Requirements.

B. Provide two unopened boxes of each tile to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong Contract Interiors.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 SUSPENSION SYSTEM MATERIALS

A. Non-Fire Rated Grid - Acoustical Tile Ceilings: ASTM C635, intermediate duty; exposed T; components die cut and interlocking; hot dipped galvanized. Product: Prelude 15/16" T-bar grid suspension system. Color: White.

B. Accessories: Stabilizer bars, hold-down clips, splices, edge and moldings required for suspended grid system.

C. Support Channels and Hangers: Hot dipped galvanized; size and type to suit application and ceiling system flatness requirement specified.

2.3 MANUFACTURERS - ACOUSTICAL UNITS

A. Armstrong Contract Interiors.

B. Substitutions: Under provisions of Division 1 - General Requirements.

2.4 ACOUSTICAL UNIT MATERIALS

A. Tile Type 1: Armstrong Angled Tegular ‘Dune’ No. 1776; conforming to the following:
   1. Size: 24 x 48 inches. Refer to reflected ceiling plan for locations.
   2. Thickness: 5/8 inch.

3. Composition: Wet-formed mineral fiber.
4. NRC Range: .50-.60.
5. CAC Range: 35.
6. Edge Detail: Angled tegular lay-in.
7. Surface Burning Characteristics: Flame spread 25 or under.
8. Grid: 15/16 inch, Prelude.
9. Grid Color: White.
10. Tile Color: White.
11. Factory applied vinyl latex paint.

2.5 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Division 1 - General Requirements.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system for each tile type in accordance with ASTM C636 and manufacturer's instructions and as supplemented in this section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Locate system on room axis according to reflected ceiling plan.

D. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Do not eccentrically load system, or produce rotation of runners.

I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete.

E. Install all units level, in uniform plane, and free from twist, warp and dents.

F. Cut tile to fit irregular grid and perimeter edge trim. Field rabbet tile edge. Double cut and field paint exposed edges of tegular units.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring – LVT.

B. Resilient base.

C. Floor levelling compound.

D. Grout for filling of existing PVC piping/floor penetrations.

E. Accessories.

1.2 RELATED SECTIONS

A. Section 033000 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Society for Testing and Materials:
1. ASTM E648 - Critical Radiant Flux - Class 1.
2. ASTM E 662 - Smoke - 450 or less.
3. ASTM F1066 - Vinyl Composition Floor Tile.

B. FS-SS-W-40 - Wall Base: Rubber and vinyl plastic.

1.3 SUBMITTALS

A. Submit under provisions of Division 1 - General Requirements: Submittals.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, 2 x 2 inch in size illustrating color and pattern for each floor material for each color specified.

D. Submit two inch long samples of base material for each color specified.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1 - General Requirements: Storage and Protection.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

B. Maintain ambient temperature required by adhesive manufacturer three days prior to,

during, and 24 hours after installation of materials.

1.6 MAINTENANCE DATA

A. Submit under provisions of Division 1 - General Requirements: Operation and Maintenance Data.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.7 EXTRA MATERIALS

A. Provide a total of 100 sq ft of VCT flooring of percentages specified and 50 lineal feet of base.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Luxury Vinyl Tile:
1. Patcraft
2. Or approved Equal

B. Vinyl Wall Base:
1. Mannington Commercial Flooring
2. Or approved equal

2.2 MATERIALS - VINYL TILE FLOORING

A. Luxury Vinyl Tile:
1. Patcraft: Set In Concrete – Aggregate.
2 Size: 24 x 24 inch
3 Thickness: 2.5 mm
4 Design: Non-directional.
5. Colors: To be selected (Assume 2 colors).
6. Installation Method: To be selected.
7. Wear Layer: 20 mil.

2.3 MATERIALS - VINYL BASE

A. Base: Standard vinyl wall base, coved and toeless; pre-molded external corners:
1. Mannington Wall Base.
2. Height: 4 inch.
3. Thickness: 1/8 inch thick.
4. Length: Roll (120 feet).
5. Colors: To be selected (Assume 2 colors).

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Sealer and Wax: Types recommended by flooring manufacturer.

D. Floor Levelling Compound: Ardex K15 self-levelling underlayment.

E. Floor Levelling Primer: Ardex P51 Primer.

F. Multi-Purpose Repair Material/Non-Shrink Grout: Rapid Set Cement All; high performance fast setting multi-purpose concrete repair material and non-shrink grout.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify concrete floors are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, or dusting.

B. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to required surfaces.

E. Existing concrete slab should be prepared and primed to an acceptable degree to install Ardex K15 self-levelling underlayment and provide a flat and level substrate for new flooring.

3.3 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Spread only enough adhesive to permit installation of materials before initial set.

C. Set flooring in place, press with heavy roller to attain full adhesion.

D. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile \ pattern.

F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - BASE

A. Fit joints tight and vertical. Maintain maximum measurement between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.5 INSTALLATION – FLOOR LEVELLING COMPOUND /MULTI-PURPOSE REPAIR MATERIAL

A. Install in accordance with manufacturer’s instructions to fill voids and provide a level floor suitable for installation of new floor finishes.

3.6 CLEANING

A. Clean work under provisions of Division 1 - General Requirements: Final Cleaning.

B. Remove access adhesive from floor, base, and wall surfaces without damage.

C. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

3.7 PROTECTION OF FINISHED WORK

A. Prohibit traffic on floor finish for 48 hours after installation.

3.8 SCHEDULE

A. See Finish Schedule for Materials and Locations.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

1.2 RELATED SECTIONS

A. Section 060010 – Carpentry Work.

B. Section 081120 - Standard Steel Frames.

C, Section 092600 – Gypsum Board Systems.

1.3 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 SUBMITTALS

A. Product Data: Provide data on all finishing products and special coatings.

B. Samples: Submit samples illustrating range of colors and textures available for each surface finishing product scheduled.

C. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

D. Manufacturer’s Safety Data Sheet (MSDS) for each product used.

1.6 QUALITY ASSURANCE

A. Single Source
   1. Provide primers and other undercoat paints produced by same manufacturer as finish coats for each application.
   2. Use only thinners approved by paint manufacturer and use only with recommended limits.

B. Coordination of Work
   1. Review other sections of these Specifications in which prime paints are to be provided, to ensure compatibility of total coatings system.
   2. Upon request from other trades, furnish information or characteristics of proposed finish materials, to ensure that compatible prime coats are used.

C. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Applicator: Company specializing in performing the work of this section with minimum years documented experience and where applicable, approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable codes, standards and specifications referenced in this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

A. Provide 1 unopened gallon of each color, type, and surface texture to Owner.

B. Label each container with color, type, texture, and room locations, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sherwin Williams.

B MAB.

C Benjamin Moore.

D Finnaren & Haley.

2.2 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.3 FINISHES

A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D2016.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect work of this section.

C. Seal with shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

G. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

H. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

I. Clean and prepare all surfaces in accordance with manufacturer's written specifications.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand wood and metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

J. Prime concealed surfaces of interior and exterior woodwork with primer paint.

K. Existing metal siding must be free of all surface contamination such as oil, grease, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar and sealers to assure sound bonding. Glossy surfaces of old paint films must be clean and dull before repainting.

L. Check for compatibility by applying a test patch of the recommended coating system, approximately 2-3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If coating system is incompatible, complete removal is required per ASTM D4259.

3.3 CLEANING

A. Clean work.

B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.4 SCHEDULE - INTERIOR SURFACES

A. Miscellaneous Wood – Painted:
   1. One coat of latex primer sealer: Sherwin Williams: Premium Wall & Wood Primer, B28W111.
   2. Two coats of semi-gloss finish: Sherwin Williams: Promar 200 Zero VOC Interior Latex Semi-Gloss B31.2600. Assume two (2) colors.

B. Steel - Unprimed:
   1. One coat of primer: Sherwin Williams: Pro Industrial Procryl Primer, B66-310.
   2. Two coats of semi-gloss finish: Sherwin Williams: Pro Industrial HP Acrylic, B66-600. Assume two (2) colors.

C. Steel - Primed:
   1. One coat of primer: Sherwin Williams: Pro Industrial Procryl Primer, B66-310.
   2. Two coats of semi-gloss finish: Sherwin Williams: Pro Industrial HP Acrylic, B66-600. Assume two (2) colors.

D. Gypsum Board:
   1. One coat of latex primer sealer, Sherwin Williams: Promar 200 Zero VOC Interior Latex Primer B28-2600.
   2. Two coats of eggshell finish, Sherwin Williams: Promar 200 Zero VOC Interior Latex Eg-Shel, B20-2600. Assume three (3) colors.

E. CMU:
   1. One coat primer/void filler: Sherwin Williams Heavy Duty Block Filler, B42W46.
   2. Two coats acrylic epoxy semi-gloss finish; Sherwin Williams Pro-Industrial Pre-catalyzed WB Epoxy, K46. Assume two (2) colors.

F. Wood – Stained/Transparent
   1. One coat sealer. Sherwin Williams: Wood Classics Interior Wood Stain, A49.
   2. Two coats varnish, Sherwin Williams: Wood Classics Waterborne Polyurethane Varnish, A68.

Note: Provide stain samples for approval where color match is required.

3.5 SCHEDULE – EXTERIOR SURFACES

A. Galvanized Steel
   1. Clean with galvanized finish cleaner.
   2. One coat of primer: Sherwin Williams DTM Wash Primer @.07 - 1.3 mils dft.
   3. Two coats of acrylic polyurethane: Sherwin Williams Acrolon 218 HS @ 3.0 - 6.0mils dft/ct.

B. Existing Vertical Metal Siding
   1. One coat primer: Sherwin Williams DTM Bonding Primer (test patch for adhesion).
   2. Two coats acrylic coating: Sherwin Williams DTM Acrylic Coating – Semi-gloss.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Solid plastic polymer toilet stalls and doors, floor mounted, head rail braced.
2. Hardware, etc.

1.2 REFERENCES

A. American National Standards Institute: ANSI A117.1 - Safety Standards for the Handicapped.

B. American Society for Testing and Materials: ASTM A167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. FS RR-P-1352 - Partitions, Toilet, Complete.

1.3 SUBMITTALS

A. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings, etc.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

D. Provide color chart for use of the Architect.

1.4 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated as on shop drawings.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Scranton Products (Hiny Hiders).

B. Or Approved Equal.

2.2 MATERIALS

A. Panels shall be solid polymer resin nominal 1" thick by 55" high of required depth with uniformly machined radius edges. Panels shall be anchored to front pilasters with continuous panel height heavy duty plastic wall brackets. Panels shall be mounted 14" above finished floor.

B. Doors shall be nominal 1" thick by 55" high. Doors shall be of the same design and construction as specified for panels. Doors shall be mounted 14" above finished floor.

C. Pilasters shall be minimum 1" thick x 82" high and of the same design and construction as specified for panels and doors. Pilasters shall be mounted to the floor within a one-piece plastic shoe and to the walls with continuous panel height plastic wall brackets. Head rail shall be extruded heavy aluminum type 6463-T5 alloy weighing no less than .75 pounds per linear foot of "Anti-Grip" design to cap top of pilasters.

D. All hardware and fasteners required for a complete installation shall be furnished and be of tamper-proof type. Doors shall be hung on manufacturer's standard integral door hinge system.

E. Coat Hook/Wall Bumper shall be heavy chrome with rubber bumper.

F. Latch shall be slide bolt type with emergency access feature which shall not require lifting of the door. Door pull shall be chrome plated "U" shaped pull. Latch and pull shall be mounted 36" AFF.

2.3 FINISHING

A. Materials shall be homogeneous polymer resin with uniform color throughout and special mar-resistant finish, in manufacturer's standard colors.

B. Colors: To be selected by Architect from Classic Color Collection or Mosaic Color Collection.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Provide adjustment for floor variations with screw jack through stainless steel saddles integral with pilaster.

E. Replace damaged or scratched materials with new materials.

3.3 ERECTION TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTMENTS

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in full closed position when unlatched.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Cabinets.

1.2 RELATED SECTIONS

A. Section 060010 - Carpentry Work: Wood blocking and shims.

1.3 REFERENCES

A. ANSI/NFPA 10 - Portable Fire Extinguishers.

B. ANSI/UL 711 - Rating and Fire Testing of Fire Extinguishers.

C. UL 626 - 2 1/2 Gallon Stored Pressure, Water Type Fire Extinguishers.

1.4 SUBMITTALS

A. Product Data: Provide extinguisher operational features, color and finish.

B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code ANSI/NFPA 10 for requirements for extinguishers.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. J.L. Industries Product - Dry chemical extinguisher; Cosmic 10E with Cosmopolitan 1037 F10 semi-recessed cabinet.

2.2 EXTINGUISHERS

A. Dry Chemical Type: UL 299, Cast steel tank, with pressure gage; Class A, B, C, Size 10 lbs.

2.3 CABINETS

A. Configuration: Semi-recessed type, exterior nominal frame dimensions of 13 inch wide x 26 inches high x 3-5/8 inch deep.

B. Type: Returned to wall surface, with 2-1/2 inch projection.

C. Door Glazing: Plastic, clear, 1/4" thick acrylic.

D. Cabinet Mounting Hardware: Appropriate to cabinet.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough openings for cabinets are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on wall brackets.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and washroom accessories.

B. Grab bars.

C. Attachment hardware.

1.2 RELATED SECTIONS

A. Section 06001 - Carpentry: Miscellaneous Wood Blocking.

1.3 REFERENCES

A. ANSI A117.1 - Safety Standards for the Handicapped.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

E. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

F. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.4 SUBMITTALS

A. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

B. Manufacturer's Installation Instructions: Indicate special procedures,and perimeter conditions requiring special attention.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI A117.1 code for access for the handicapped.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on product data and instructed by the manufacturer.

1.7 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bobrick.

B. Substitutions under provisions of Division 1 – General Requirements.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Adhesive: Two component epoxy type, waterproof.

E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind joints of fabricated components, smooth.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with minimum 1/2 inches clear of wall surface. Knurl grip surfaces.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

2.4 KEYING

A. Supply 3 keys for each accessory to Owner.

B. Master key all accessories.

2.5 FINISHES

A. Galvanizing: ASTM A123 to 1.25 oz/sq yd. Galvanize ferrous metal and fastening devices.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

D. Stainless Steel: No. 4 satin luster finish.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.

C. Verify exact location of accessories for installation.

D. Contractor to verify all quantities prior to ordering.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions and ANSI A117.1.

B. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Equipment installation requirements common to equipment sections.
7. Painting and finishing.
8. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Mechanical sleeve seals.
3. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. The plumbing system shall comply with “The Reduction of Lead in Drinking Water Act (P.L. 111-380) which amends the Safe Drinking Water Act (42 USC 300g-6).

E. The plumbing system shall comply with the current adopted plumbing code for this project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

PART 3 EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type, polished chrome-plated finish with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish and set screw.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish and set screw.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with set screw.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes in walls only, but are required in floors.

N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. 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.

F. 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.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic 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. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. 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. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION

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. Thermometers.
2. Gages.
3. Test plugs.

B. Related Sections:

1. Division 22 Section "Domestic Water Piping" for domestic and fire-protection water service meters inside the building.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.

C. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART 2 PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

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. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Chrome-plated brass, 7 inches long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS

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. Tel-Tru Manufacturing Company.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.

C. Case: Liquid-filled type, stainless steel with 5-inch diameter.

D. Element: Bimetal coil.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Black metal.

G. Window: Glass.

H. Ring: Stainless steel.

I. Connector: Adjustable angle type.

J. Stem: Metal, for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

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. Tel-Tru Manufacturing Company.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

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. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Liquid-filled type, drawn steel or cast aluminum 4-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Black metal.
7. Window: Glass.
8. Ring: Stainless steel.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS

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. Sisco Manufacturing Co.
2. Trerice, H. O. Co.
3. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for water service at 20 to 200 deg F shall be CR.
2. Insert material for water service at minus 30 to plus 275 deg F shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, one thermometer, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
4. Carrying case shall have formed instrument padding.

PART 3 EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass bimetallic-actuated dial thermometers in the outlet of each domestic, hot-water storage tank.

B. Install liquid-filled-case-type, bimetallic-actuated dial thermometers at suction and discharge of each pump.

C. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install liquid-filled-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install liquid-filled-case-type pressure gages at suction and discharge of each pump.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage.

E. Install test plugs in tees in piping.

F. Install permanent indicators on walls or brackets in accessible and readable positions.

G. Install connection fittings for attachment to portable indicators in accessible locations.

H. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

I. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION

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. Brass ball valves.
2. Bronze ball valves.

B. Related Sections:

1. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 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 ball and plug valves open to minimize exposure of functional surfaces.
4. Block 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. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Hammond Valve.
    d. Milwaukee Valve Company.

2. Description:

    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Two piece.
    e. Body Material: Forged brass.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

B. Three-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Jomar International, LTD.
    b. Kitz Corporation.
    c. Marwin Valve; a division of Richards Industries.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Three piece.
    e. Body Material: Forged brass.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Hammond Valve.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.
   i. Ball: Stainless steel, vented.
   j. Port: Full.

B. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO INC.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Three piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.
   i. Ball: Stainless steel, vented.
   j. Port: Full.

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.

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. Shutoff Service: Ball valves.
2. Throttling Service: Ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 3 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.

3.6 COMPRESSED AIR VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.

END OF SECTION

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 hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe positioning systems.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Pipe positioning systems.

B. Shop Drawings Signed and sealed by a qualified professional Architect. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel." and ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Empire Industries, Inc.
3. ERICO/Michigan Hanger Co.
4. Globe Pipe Hanger Products, Inc.
5. Anvil Corp.
6. GS Metals Corp.
7. National Pipe Hanger Corporation.
8. PHD Manufacturing, Inc.
9. PHS Industries, Inc.
10. Piping Technology & Products, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.Fiberglass strut systems in this Article require calculation and detail of each unit.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. 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. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Available Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. 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 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, 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 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-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.
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 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 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
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 might occur and vertical adjustment is not necessary.
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 might be required in addition to expansion and contraction.

G. 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 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. 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.

I. 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
    d. de-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
14. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. 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.

K. 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 (32 mm).
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 absorb 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 absorb 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 absorb 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.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. 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.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. 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.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. 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.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

N. Insulated Piping: Comply with the following:

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 according to 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 inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 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 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. Touch Up: 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. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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 labels.
2. Valve tags.
3. Warning tags.

1.3 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. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.2 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) 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.

2.3 WARNING TAGS

A. Warning Tags: 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: 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 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

B. 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 20 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: Green.
b. Letter Color: White.

2. Sanitary Waste and Vent Piping:

a. Background Color: White.
b. Letter Color: Black.

3. Compressed Air Piping:

a. Background Color: White.
b. Letter Color: Black.

3.3 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, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Cold Water: Natural.
b. Hot Water: Natural.

3. Letter Color:

a. Cold Water: Black.
b. Hot Water: Black.

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

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. Insulation Materials:
    a. Flexible elastomeric.
    b. Mineral fiber.
2. Adhesives.
3. Mastics.
4. Sealants.
5. Factory-applied jackets.
6. Tapes.
7. Securements.
8. Corner angles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets.

B. Shop Drawings:

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.
3. Detail removable insulation at piping specialties, equipment connections, and access panels.
4. Detail application at control devices.
5. Detail field application for each equipment type.

C. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 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.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment 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.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Available products that may be incorporated into the Work shall be one of the following:

a. Johns Manville; Micro-Lok HP.
b. Knauf Insulation; 1000 Pipe Insulation ASJ+.
c. Owens Corning; SSL II with ASJ MAX Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "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: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. ASJ Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.4 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

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.

2.5 CORNER ANGLES

A. PVC Corner Angles: 30 mil thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White to match adjacent surface.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. 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.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

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 equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each 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 bottom of horizontal runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

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.
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.

J. 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.
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.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere and seal patches similar to butt joints.

N. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant

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: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "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, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, 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 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 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 used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
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 two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. For services not specified to receive a field-applied jacket except for flexible elastomeric, 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.
8. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

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 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 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 MINERAL-FIBER INSULATION INSTALLATION

A. 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.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as 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.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as 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 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.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. Insulation shall be one of the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

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. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Flexible connectors.
4. Escutcheons.
5. Sleeves and sleeve seals.
6. Wall penetration systems.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.4 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Dielectric fittings.
3. Backflow preventers and vacuum breakers.
4. Escutcheons.
5. Sleeves and sleeve seals.
6. Water penetration systems.

B. Water Samples: Specified in "Cleaning" Article.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. 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.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

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. EPCO Sales, Inc.
d. Hart Industries International, Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

a. Pressure Rating: 150 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.6 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew.

E. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew.

G. One-Piece Floor Plates: Cast-iron flange.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.8 SLEEVE SEALS

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. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.9 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install domestic water piping level and plumb.

F. Install seismic restraints on piping. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. 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.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping adjacent to equipment and specialties to allow service and maintenance.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 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: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings couplings or nipples nipples unions.

C. Dielectric Fittings for NPS 2-1/2 and Larger: Use dielectric flanges.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet: If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow 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. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.

3. 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.

3.8 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
c. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
d. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish cast brass with rough-brass finish.
e. Bare Piping in Equipment Rooms: One piece, cast brass.
f. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

D. Install sleeves in new partitions, slabs, and walls as they are built.

E. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

F. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

G. Seal space outside of sleeves in concrete slabs and walls with grout.

H. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

I. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

a. Extend sleeves 2 inches above finished floor level.
b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is

specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

   a. Steel pipe sleeves for pipes smaller than NPS 6.
   b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
   c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.

5. Sleeves for Piping Passing through Interior Concrete Walls:

   a. Steel pipe sleeves for pipes smaller than NPS 6.
   b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

5. Piping Tests:

6. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
7. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
8. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
9. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
10. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
11. Prepare reports for tests and for corrective action required.

C. Domestic water piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.13 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. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 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. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.15 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Brazed joints may be used on aboveground copper tubing.

D. Aboveground domestic water piping, shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B) wrought- copper solder-joint fittings; and soldered joints.

3.16 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball for piping NPS 3 and smaller.
2. Throttling Duty: Use ball valves for piping NPS 3 and smaller.
3. Drain Duty: Hose-end drain valves.

END OF SECTION

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 domestic water piping specialties:

1. Hose bibbs.
2. Drain valves.
3. Water hammer arresters.

B. Related Sections include the following:

1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ames Co.
    b. Watts Industries, Inc.; Water Products Div.
    c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Watts Industries, Inc.; Water Products Div.
    b. Woodford Manufacturing Company.
    c. Zurn Plumbing Products Group; Light Commercial Operation.
    d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.2 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.3 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.

2.4 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Sioux Chief Manufacturing Company, Inc.
b. Watts Drainage Products Inc.
c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows or Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install water hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Mechanical sleeve seals.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Dielectric fittings.
5. Mechanical sleeve seals.
6. Escutcheons.

B. Qualification Data: For qualified professional engineer.

C. Welding certificates.

D. Field quality-control reports.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 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.

PART 2 PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

6. 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) Dresser Piping Specialties; Division of Dresser, Inc.
        2) Smith-Blair, Inc.

    b. Steel flanges and tube with epoxy finish.
    c. Buna-nitrile seals.
    d. 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.

2.2 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.

2.3 MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Article 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 "Aboveground Manual Gas Shutoff Valve Schedule" Article.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.

3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

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 "Aboveground Manual Gas Shutoff Valve Schedule" Article.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Article.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lee Brass Company.
    b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Cast-Iron, Nonlubricated 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. McDonald, A. Y. Mfg. Co.
    b. Mueller Co.; Gas Products Div.
    c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Flowserve.
    b. Homestead Valve; a division of Olson Technologies, Inc.
    c. McDonald, A. Y. Mfg. Co.
    d. Milliken Valve Company.
    e. Mueller Co.; Gas Products Div.

f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.4 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.6 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.

B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Escutcheons: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

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. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

C. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten

bolts against pressure plates that cause sealing elements to expand and make watertight seal.

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. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
c. Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
d. Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Piping in Equipment Rooms: One-piece, cast-brass type.
f. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
g. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. 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.

O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In 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.
c. Do not install natural gas piping in floors, slabs or concrete.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. 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.

S. Do not use natural-gas piping as grounding electrode.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

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. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping.

B. Comply with requirements for pipe hangers and supports specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 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 72 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 Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.

3.10 PAINTING

A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, 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).
d. Color: Gray.

C. Paint exposed, interior 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. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat).
d. Color: Selected by Architect.

D. 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 OUTDOOR PIPING SCHEDULE

A. 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.

B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 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. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

END OF SECTION

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 for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.4 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 be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
2. Sovent Drainage System: Include plans, elevations, sections, and details.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) Fernco, Inc.
2) Ideal Div.; Stant Corp.
3) Mission Rubber Co.

4) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) Clamp-All Corp.
2) Ideal Div.; Stant Corp.
3) Mission Rubber Co.
4) Tyler Pipe; Soil Pipe Div.

2.5 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.6 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, Schedule 40, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656

1. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Solvent Cement: ASTM D 2564

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

C. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.; DMD Div.
c. EBAA Iron Sales, Inc.
d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
e. JCM Industries, Inc.
f. Romac Industries, Inc.
g. Smith-Blair, Inc.
h. Viking Johnson.

2. Center-Sleeve Material: Stainless steel.
3. Gasket Material: Natural or synthetic rubber.
4. Metal Component Finish: Corrosion-resistant coating or material.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping 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 heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints, as allowed by the state plumbing code.
5. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Aboveground, vent piping 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; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints, as allowed by the state plumbing code.
5. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Underground, soil, waste, and vent piping shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints, as allowed by the state plumbing code.
3. Dissimilar Pipe-Material Couplings: Flexible, Shielded, Rigid, unshielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.2 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install seismic restraints on piping.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

E. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

F. 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."

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or

side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the State Plumbing Codes minimum slopes.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665 and state plumbing code.

L. Install underground PVC soil and waste drainage piping according to ASTM D 2321 and state plumbing code.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. 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.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Install full-port ball valve for piping NPS 3 and smaller.
2. Install gate valve for piping NPS 4 and larger.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    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.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and 5: 48 inches with 5/8-inch rod.

4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

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 drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 25-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

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 sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Through-penetration firestop assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

B. Manufacturer Seismic Qualification Certification: Submit certification that grease interceptors, accessories, and components will withstand seismic forces defined in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Watts Drainage Products Inc.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Closure: Plastic plug.
7. Adjustable Housing Material: Cast iron with threads.
8. Frame and Cover Material and Finish: Polished Nickel-bronze.
9. Frame and Cover Shape: Round.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Raised-head, drilled-and-threaded Bronze plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.3.

3. Pattern: Floor drain.
4. Body Material: Coated cast iron.
5. Outlet: Bottom.
6. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
7. Top or Strainer Material: Polished Nickel bronze.
8. Top of Body and Strainer Finish: Polished Nickel bronze.
9. Top Shape: Round.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 10 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.

2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch-minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated or required per the state plumbing code.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with cover flush with finished wall.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

H. Assemble open drain fittings and install with top of hub 2 inches above floor.

I. Install deep-seal traps on floor drains and other waste outlets if indicated.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install wood-blocking reinforcement for wall-mounting-type specialties.

M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

N. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. 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 Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

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 conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Lavatories.
8. Commercial sinks.

B. Related Sections include the following:

1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PMMA: Polymethyl methacrylate (acrylic) plastic.

H. PVC: Polyvinyl chloride plastic.

I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
2. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
3. Vitreous-China Fixtures: ASME A112.19.2M.
4. Water-Closet, Tank Trim: ASME A112.19.5.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets: ASME A112.18.1.

2. Hose-Coupling Threads: ASME B1.20.7.
3. NSF Potable-Water Materials: NSF 61.
4. Supply Fittings: ASME A112.18.1.
5. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Brass Waste Fittings: ASME A112.18.2.
4. Battery-Operation Flushometers: ASSE 1037 and UL 1951.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Floor Drains: ASME A112.6.3.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Plastic Toilet Seats: ANSI Z124.5.
5. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools 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 Commercial Applications: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 Vitreous fixtures shall be American Standard, Kohler, Zurn, or approved equal.

2.2 Lavatory carriers shall be Jay R. Smith, Josam, Zurn, or approved equal.

2.3 Water closet seats shall be Bemis, Olsonite, Zurn or approved equal.

2.4 Plumbing fixture trim shall be American Standard, T&S Brass, Zurn or approved equal.

2.5 Stainless steel sinks shall be Elkay, Just, or approved equal.

2.6 Plumbing Fixtures

2.7 Refer to Drawing P0.1 for Manufacturer, Model Number and Description.

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 cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. 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. Exception: Use ball or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

K. Install flushometer valves for accessible urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

L. Install toilet seats on water closets.

M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

O. 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.

P. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

Q. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

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 General Provisions for HVAC/Mechanical work.

B. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Concrete bases.
10. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

1.4 SUBMITTALS

A. SHOP DRAWINGS AND OTHER RELATED SUBMITTALS

1. The type submittal information required for each item of equipment shall be as indicated in the individual sections of the specification.
2. When a substitute item of equipment has been submitted for approval, submit layout drawings indicating the changes necessary to adapt the substituted item of equipment to the system design.
3. Submittal data shall include Specification data, such as metal gauges, finishes, optional accessories, etc., even though such equipment and materials may be detailed on the drawings or specified. In addition, the submittal data shall include performance (certification) data, wiring diagrams where applicable, accurate dimensional data and a recommended spare parts list. Outline or dimensional drawings alone are not acceptable. No roughing-in, connections, etc., shall be done until Architect reviewed equipment submittals are in the hands of the

Contractors. It shall be the Contractor's responsibility to obtain drawings and to make all connections, etc., in the neatest and most workmanlike manner possible.

4. In general, normal catalog information (with the particular items underlined or otherwise denoted as being the submitted item) will be acceptable as submittal data. Installation, operating and maintenance instructions must be that information, specifically applicable to the items furnished, ordinarily supplied with the equipment to the Owner with any modifications indicated. Wiring diagrams must be correct for the application. Generalized wiring diagrams, showing alternate methods of connection, will not be acceptable unless all unrelated sections are marked. out. Submittal data sheets, which indicate several different model numbers, figure numbers, optional accessories, installation arrangements, etc., shall be clearly marked to indicate the specific items of equipment to be furnished. Samples and certificates shall be furnished as requested. Submittal data must be complete for each piece of equipment; piecemeal data will not be processed.
5. It shall be noted that the reviewing of shop drawings by the Architect applies only to general design, arrangement, type, capacity, and quality. Such review does not apply to quantities, dimensions, connection locations and the like. In all cases, the Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, that all equipment fits the available space in a satisfactory manner, all equipment characteristics are appropriate and that all connections are suitably located.
6. Before the project is accepted, all submittal data (shop drawings, etc.) must be complete and reviewed.
7. After equipment requiring temperature control connection has been reviewed by the Architect, furnish complete manufacturer's data and wiring diagrams to the Automatic Temperature Control Supplier.

B. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

C. Welding certificates.

D. SUBSTITUTION OF MATERIALS AND EQUIPMENT

1. When the Contractor requests approval of substitute materials and/or equipment, except when under formal alternate proposal, it shall be understood and agreed that such substitution, if approved, will be made without cost to the Owner, regardless of changes in connections, spacing, electrical service, etc. In all cases where substitutions affect other trades the Contractor offering such substitutions shall reimburse all affected Contractors for all necessary changes in their work (without cost to Owner).

1.5 QUALITY ASSURANCE

A. Disclaimers and Limitations: Manufacturer’s disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer’s disclaimers and limitations on product warranties do not relieve

suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordination Between Trades:

1. Carefully examine all architectural, structural, electrical and any other drawings and specifications pertaining to the construction before fabricating and installing the work described and indicated under these drawings and specifications. Cooperate with all other Contractors in locating piping, ductwork, sleeves, equipment, etc., in order to avoid conflict with all other Contractor's work. No extra compensation will be allowed to cover the cost of relocating piping, ducts, etc., or equipment found encroaching on space required by others.
2. Lay out work from construction lines and levels established by the General Contractor. This Contractor shall be responsible for the proper location and placement of his work.
3. Any discrepancies occurring on the accompanying drawings and between the drawings and the specifications shall be reported to the Architect prior to any fabrication and installation so that a workable solution can be presented. Extra payment will not be allowed for the relocation of, or revision to, piping, ductwork, equipment, etc., not installed in accordance with the above instructions, and which interferes with work and equipment of other trades.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

1. Available Manufacturers:

a. Watts Industries, Inc.; Water Products Div.
b. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Epco Sales, Inc.
b. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Central Plastics Company.
c. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Available Manufacturers:

a. Precision Plumbing Products, Inc.
b. Sioux Chief Manufacturing Co., Inc.
c. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

    a. Calpico, Inc.
    b. Metraflex Co.
    c. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM and/or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.1 STRUCTURAL RESPONSIBILITY

A. Properly shore, brace, support, etc., any construction to guard against cracking, settling, collapsing, displacing or weakening. No structural member shall be cut without the written consent of the Architect.

B. Any damage occurring to the structure, due to failure to exercise proper precautions or due to action of the elements, shall be promptly and properly made good to the satisfaction of the Owner or Architect, without cost.

3.2 EXISTING IMPROVEMENTS

A. Maintain in operating condition all active utilities, sewer, gutters and other drains, etc., encountered in the utility installation. Repair to the satisfaction of the Architect and the Owner any surfaces or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.

B. Any obstructing utilities encountered in the course of this work, not shown on the drawings, nor evident during inspection prior to starting the work, shall be relocated as directed by the Architect.

3.3 PROTECTION OF THE BUILDNG AND STORED EQUIPMENT

A. Do not store materials or equipment on any floor or roof of building in such quantity that these parts of the building will be overloaded in any way. Do not move heavy equipment across any floor or roof without first submitting the details of the work to the Architect and having obtained his approval. In cases where frequent movement of men or materials over the roof is encountered, provide walking boards or other suitable protection for the roofing.

B. Provide suitable storage for, and completely protect all materials and equipment prior to installation. Storage shall be dry, clean and safe. Any materials or equipment lost through theft or mishandling shall be replaced, all without additional cost to the Owner

3.4 DRAWINGS

A. The drawings accompanying these specifications are diagrammatic and indicate the general design and arrangement of the proposed work. Do not scale drawings for the exact location of equipment and work. The exact routing and/or location of piping, ductwork, sleeves, equipment, etc., unless specifically dimensioned on the drawings,

shall be determined to suit field conditions encountered, and to avoid interferences with other Contractors' work.

3.5 EQUIPMENT CONNECTIONS

A. Make all water and drainage connections, etc., to equipment furnished by others under this Contract whenever such equipment is shown on any of the drawings or mentioned in any section of the specifications, unless otherwise specifically specified hereinafter.

3.6 TOOLS

A. Furnish and install all special wrenches, valve handles, keys, or other special tools as necessary to dismantle or service any piece of equipment installed. This shall include thermostat keys in the number directed by the Architect.

3.7 PERMITS AND APPROVALS

A. All permits and certificates of approval for the complete system shall be obtained by the respective Contractors from the authorities governing such work. The cost of all permits, tap-in-fees and approvals shall be borne by the Contractor furnishing the work, except as noted in the General Requirements. All work shall be approved by the Architect before final payment will be made.

3.8 TEMPORARY UTILITIES

A. Temporary utilities for water, gas, electricity, and heat shall be provided as indicated under the "General Requirements" of the Specifications.

3.9 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Insulated Piping: One-piece, stamped-steel type with spring clips.
c. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and spring clips set screw or spring clips.
d. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
e. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
f. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 92 00 Section "Joint Sealants" for materials and installation.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 84 13 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.10 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.11 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.12 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.13 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.14 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03."

3.15 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.16 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.17 INSTALLATION

A. All equipment shall be installed at locations indicated.

B. Assembly and installation of equipment shall be in strict accordance with manufacturer's installation instructions.

C. Equipment shall be securely anchored in place. Care shall be exercised to correctly orient equipment before securing in place.

3.18 EQUIPMENT PADS AND GROUTING

A. Floor-mounted equipment, such as air handling units, boilers, water heaters, etc., shall be provided with a suitable concrete pad. Each pad shall have suitable hold-down bolts in pipe sleeves, of sufficient number to properly secure the apparatus. Hold-down bolts shall be accurately located by template prepared from actual measurement of the equipment or from certified drawings furnished by the equipment manufacturer. Hold-down bolts shall be set in wrought iron pipe sleeves ¾” larger than the bolts to facilitate alignment of equipment.

B. All pads shall be complete with all pipe sleeves, anchor bolts, reinforcing steel, concrete, etc., as required. Pads larger than 18” in width shall be reinforced with ½” bars on 9” centers, both ways. Bars shall be approximately 3” below top of pad. All parts of pads and foundations shall be properly spaced. If exposed parts of the pads and foundations are rough after removing forms, all rough surfaces shall be rubbed to a smooth surface.

C. Pads, unless indicated otherwise, shall extend 4” above the finished floor and shall be securely anchored to the floor so vibration or stresses cannot cause lateral movement.

D. In general, pads for equipment such as air handling units, pumps, etc., shall extend 6” beyond base dimensions.

E. Where grouting is required, equipment shall be set to use by jack screws or by use of wedges where no jack screws are provided. After grout has set up, the supporting jack

screws or wedges shall be removed and the holes left by removal of the wedges shall be dry packed.

3.19 EQUIPMENT MOUNTING

A. All equipment with moving parts, such as fans, air handling units, etc., shall be mounted on vibration supports and in addition, said equipment shall be isolated from external connections, such as piping, ducts, raceways, etc., by means of flexible connectors.

B. Unitary equipment, such as small exhaust fans, etc., shall be rigidly braced and mounted to wall, floor, or ceiling, as required, and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation

C. Where drivers are connected with couplings, the alignment shall be checked and the driver reconnected. Couplings shall have tolerances as indicated by the manufacturer.

D. Where drivers are connected with belt or chain drives, the driver and driver shafts shall be aligned parallel. The motor adjustment shall be loosened sufficiently to put on the belts or chain and then tightened to the proper centerline distance or tension. No belt compound shall be used.

3.20 PLATFORMS AND SUPPORTING STANDS

A. Each piece of equipment or apparatus mounted above the floor level shall be supported in accordance with the best recognized practice.

B. Such supporting or mounting means shall be provided by each Contractor for all equipment furnished by him.

C. Exercise extreme care that structural members of building are not overloaded by such equipment.

D. All structural members of platforms, supporting stands, etc., shall be factory prime coated.

E. Finish painting shall be the responsibility indicated under SECTION PAINTING, DIVISION FINISHES.

3.21 METAL GUARDS

A. Furnish and install in approved expanded metal or sheet metal guard around all exposed moving and rotating parts, such as pump couplings, belt drives, fan belts, etc.

3.22 FRAMING

A. All rectangular or special shaped openings in walls, partitions, roofs, ceilings, etc., including plaster, stucco, or similar materials shall be framed by means of plaster frames, casing beads, wood or metal angle members, as required. The intent of this paragraph is to prohibit cutting and patching in new construction and to provide smooth, even termination of wall, floor, and ceiling finishes, as well as to provide a fastening means for grilles, diffusers, etc. Lintels shall be provided over all openings in walls, etc., when not specifically indicated elsewhere. Lintels shall be of size and shape to prevent excessive deflection and shall be approved by Architect prior to installation.

3.23 CUTTING, FITTING AND PATCHING

A. Each respective Contractor shall do all cutting and drilling of masonry, steel, wood, or iron work, and all fitting necessary for the proper installation of all apparatus and materials.

B. No cutting or drilling of the structure, of any kind, shall be done without first obtaining permission from Architect. All cutting and drilling shall be done under the supervision of the General Contractor in strict accordance with instructions furnished by Architect.

C. All patching and finishing shall be the responsibility of the Contractor whose cutting or drilling makes such patching and finishing necessary. Patching and finishing shall be done by workmen skilled in the trade affected (masonry, plastering, painting, etc.).

3.24 CLEANING, TESTING AND PREPARATION FOR START-UP

A. All equipment shall be cleaned of all foreign material.

B. All equipment shall be lubricated and placed in proper working order. Drives on rotating equipment shall be checked for proper rotation and alignment. V-belt drives shall be checked and adjusted for proper tension. All fans shall be operated for at least 24 hours so that the initial stretch of the V-belt drives will take place before testing. When the belts have stretched, the fan drives shall be realigned and adjusted for tightness to make sure that the excess slippage is eliminated. All drives shall be set for the recommended speeds. All sheaves and bearing blocks shall be checked for any loose screws or nuts.

C. All controls and safety devices shall be checked to determine that they are in place and properly installed.

D. Where equipment is intended to contain fluids, it shall be filled and tested for leaks as recommended by the equipment manufacturer.

E. Equipment shall be operated for a reasonable time to determine any undue vibration, heating of parts, or other improper operation.

END OF SECTION

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 the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.
3. Division 23 Section Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
4. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.

C. This specification is inclusive in nature to indicate the design intent with materials available. Not all products listed may be required.

D. This specification is not intended to be all inclusive. Piping shall be supported utilizing products based on the design requirements.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.3, "Structural Welding Code--Sheet Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel." ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. B-Line Systems, Inc.; a division of Cooper Industries.

3. Globe Pipe Hanger Products, Inc.
4. Grinnell Corp.
5. National Pipe Hanger Corporation.
6. PHD Manufacturing, Inc.
7. Piping Technology & Products, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Power-Strut Div.; Tyco International, Ltd.
3. Thomas & Betts Corporation.
4. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. PHS Industries, Inc.
2. Pipe Shields, Inc.
3. Rilco Manufacturing Company, Inc.
4. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) 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. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. 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 14.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 14, requiring clamp flexibility and up to 4 inches of insulation.
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. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 14.
5. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 14, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

G. 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 14.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 14, if longer ends are required for riser clamps.

H. 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. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. 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. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
10. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
11. 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 (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. 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.

K. 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 (32 mm).
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 absorb 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 absorb 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 absorb 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.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.

F. Install hangers and supports complete with necessary 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 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 so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

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 according to ASME B31.1 for power piping and 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.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. 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 smooth bearing surface.

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 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 contours of welded surfaces match adjacent contours.

3.5 INSTALLATION

A. Unless otherwise specifically indicated, all supporting, hanging, and anchoring of piping, ductwork, equipment, etc., shall be done by each Contractor as is necessary for completion of the work.

B. Supporting and hanging shall be done so that extensive load will not be placed on any one hanger and so as to allow for proper pitching and expansion of piping. Hangers and supports shall be placed as near as possible to joints, turns, and branches.

C. For concrete construction, utilize adjustable concrete inserts for fasteners except that expansion anchors shall be used for heavy loading and conditions and power driven

devices may be used for light loading conditions. Utilize beam clamps for fastening to steel joists and beams and expansion anchors in masonry construction. When piping is run in joist webbing, utilize bar joist clamps for fastening unless otherwise detailed. Whenever possible, piping shall be top mounted on trapeze type hangers with each pipe individually clamped to trapeze hanger.

D. Trapeze hangers shall be supported by steel rods of sufficient diameter to support piping from joists or concrete construction. Where required, piping may be double mounted on trapeze hangers. Where conditions permit, trapeze hangers may be surface mounted on exposed joists by means of approved beam clamps, or to concrete construction by means of approved adjustable inserts or expansion anchors.

E. Install all miscellaneous steel other than designed building structural members as required to provide means of securing hangers, supports, etc., where piping does not pass directly below or cross steel joists.

F. Piping shall not be supported by the equipment to which it is connected. Support all piping so as to remove any load or stress from the equipment. Particular attention shall be given to equipment where flexible connectors are involved, such as base-mounted pumps. Piping shall be rigidly supported on both sides of flexible connectors. Install flexible connectors as indicated.

G. Where piping, etc., is run vertically, approved riser clamps, brackets, or other means shall be utilized at approximately 10'-0" center to center, minimum, and utilized at the base of the vertical run.

H. Piping supported below by knee-braced frames and brackets at walls, columns, etc. shall be supported by rollers for heating hot water, domestic hot water and chilled water for pipe sizes 2½” and larger. Rollers shall be sized for thickness of insulation. Other piping shall be clamped or held in place to maintain alignment.

I. Support piping likely to transmit vibration noises with isolator hangers.

J. Support all ceiling-hung equipment (equipment with any moving parts) from steel spring type vibration isolators.

K. Copper clad type hangers shall be provided for uninsulated copper tubing and pipe.

L. Where two or more pipes are run parallel to one another, they may be supported from a trapeze type hanger arrangement. Hanger shall be properly sized to support all piping installed on hangers. Rollers shall be provided for heating hot water, and chilled water for pipe sizes 2½” and larger. Rollers shall be sized for thickness of insulation. Other piping shall be clamped or held in place to maintain alignment.

M. Pipe covering protection saddles for the insulation thickness installed shall be provided for all heating hot water which is steel pipe 2½” and larger. Pipe covering shields for the insulation thickness installed shall be provided for all heating hot water, chilled water for pipe sizes 2” and smaller, and all copper pipe for pipe sizes 2½” and larger. Wood insulation saddles for the insulation thickness installed shall be provided for all chilled water for pipe sizes 2½” and larger. Pipe covering protection sleeves for the insulation thickness installed shall be provided in place of pipe covering shields at locations where pipe is supported below by knee-braced frames, brackets and trapeze type hangers

where piping is clamped or held in place to maintain alignment and where top rollers are installed.

N. Under no condition will perforated band iron or steel wire drive hangers be permitted.

O. In general, support piping at the following spacing:

1. Steel and copper piping - 8’ intervals for piping 3” and smaller; 12’ intervals for larger piping, except if requested at closer spacing for future piping as indicated.

3.6 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 (40 mm).

3.7 PAINTING

A. Touch Up: 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 (0.05 mm).

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections. Section "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch or Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

3. 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.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. 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: White.
3. Background Color: Blue.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus 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: Red, White or Yellow.

C. Background Color: Red or Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering

for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially or full cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, alkyd or acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd or acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch or Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) 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. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Reinforced grommet, Brass grommet, and wire or string.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 EXECUTION

3.1 EQUIPMENT, PIPING, AND DUCTWORK

A. All main items of mechanical equipment shall be identified with signs made of laminated plastic with 1/8” or larger engraved letters. Signs shall be securely attached by rustproof screws or some other permanent means. Information on sign shall include name of equipment, rating, maintenance instructions, and any other important data.

B. All painting of piping shall be the responsibility as specified under Section "Painting" of Division "Finishes".

C. All exposed and accessible piping (above removable ceilings, etc.) above ¾” in diameter shall be identified as to function and direction of flow by means of manufactured pipe markers.

3.2 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.

3.3 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 Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting High-Performance Coatings."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles , complying with ASME (ANSI) A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. 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 25 feet (7.6 m) along each run. Reduce intervals to 15 feet (4.9 m) <Insert dimension> in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.5 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts.

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 25 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. HVAC equipment quantitative-performance settings.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

1.2 SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

B. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

C. Warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC, NEBB or TABB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." or SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing." TAB firm's forms approved by Architect. TABB "Contractors Certification Manual."

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."

E. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.7.2.3 - "System Balancing."

1.4 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.6 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

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.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of

these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

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 equipment performance data including fan and pump curves. 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. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.

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 strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111, AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS (EXHAUST FANS AND FAN COIL UNITS)

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.

3.10 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
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 firm 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, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, 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.

E. 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 outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing 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 testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Cellular glass.
b. Flexible elastomeric.
c. Mineral fiber.

2. Adhesives.
3. Mastics.
4. Sealants.
5. Factory-applied jackets.
6. Tapes.
7. Securements.
8. Corner angles.

B. Related Sections:

1. Division 21 Section "Fire-Suppression Systems Insulation."
2. Division 22 Section "Plumbing Insulation."

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

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 at linkages of control devices.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 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. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cell-U-Foam Corporation; Ultra-CUF.
b. Pittsburgh Corning Corporation; Foamglas Super K.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. 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 I or II with factory-applied vinyl jacket, III with factory-applied FSK jacket or III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ or with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ or with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

J. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F (649 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. 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. Cellular-Glass, Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-96.
b. Foster Products Corporation, H. B. Fuller Company; 81-33.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; CP-76-8.
   b. Foster Products Corporation, H. B. Fuller Company; 95-44.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.

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. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

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. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper 2.5-mil- thick Polysurlyn.
5. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Flange and union covers.
    d. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    b. Compac Corp.; 104 and 105.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    b. Compac Corp.; 110 and 111.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    b. Compac Corp.; 130.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.

3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel Aluminum or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) GEMCO; Nylon Hangers.
      2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

   b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
   c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
        2) GEMCO; Press and Peel.
        3) Midwest Fasteners, Inc.; Self Stick.

    b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
    c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
    d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, aluminum, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:

        1) GEMCO.
        2) Midwest Fasteners, Inc.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

PART 3 EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

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 application and finishing.

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 at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

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 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar 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. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations 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. 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 Division 07 Section "Penetration Firestopping" and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

a. Do not weld anchor pins to ASME-labeled pressure vessels.
b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
d. Do not overcompress insulation during installation.
e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
f. Impale insulation over anchor pins and attach speed washers.
g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches) o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

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, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, 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 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 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 used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including

the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

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 two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
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.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

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 adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

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 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 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.

3.8 MINERAL-FIBER INSULATION INSTALLATION

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 but 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 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 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.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and

over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. 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.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. 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.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. 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.
2. Inspect field-insulated equipment, 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 type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two < locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. 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, exposed supply and outdoor air.

B. Items Not Insulated:

1. Factory-insulated flexible ducts.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 1-1/2 inches thick and 1.5-lb/cu. ft nominal density.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric or Mineral-fiber, preformed pipe insulation, 1 inch thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible elastomeric, 1 inch thick.

END OF SECTION

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. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and International Building Code’s seismic requirements.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004. No insulation surfaces shall contact air stream.

D. Carefully coordinate duct construction, color, painting, location, etc. with the Architectural drawings, Architect, and construction manager. Submit all ductwork features before fabrication, ordering, etc. The exposed ductwork is an architectural feature of this facility.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Factory- and shop-fabricated ducts and fittings.
2. Fittings.
3. Reinforcement and spacing.

4. Seam and joint construction.
5. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

C. TDC/TDF FORMED-ON FLANGES: Formed-on flanges (TDC/TDF/T25A-25B) will be accepted. Formed on flanges shall be constructed as SMACNA T-25 flanges whose limits are defined on Page 1.36, 1995 SMACNA Manual, Second Edition. Formed-on flanges are not allowed beyond 42” wide ductwork, or above 2” w.g. No other duct construction pertaining to formed-on flanges will be accepted.

D. FUNCTIONAL CRITERIA: Construct rectangular ductwork to meet all functional criteria defined in Section VII, of the SMACNA “HVAC Duct Construction Standards, Metal and Flexible" 1995 First Edition. All ductwork must comply with local, state and federal code requirements.

PART 2 PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) 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 according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," 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. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 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 (Z275).
2. Finishes for Surfaces Exposed to View: Mill phosphatized. Ductwork shall also be paint grip for field painting.

2.3 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. 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: 3 inches (76 mm); 4 inches (102 mm); and 6 inches (152 mm)-dependant on duct size.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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 (2500 Pa), 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. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. 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. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts 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 6” (150 mm), 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 (38 mm).

J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Generally comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

L. Flexible connections shall be provided at all connections between ducts and equipment such as fans or air handling units.

M. Provide access doors at all fire damper locations and such other locations as required to allow servicing or inspection of equipment or accessories.

N. All offsets, fittings, and accessories required by the Contract Documents but not specifically indicated shall be furnished and installed in strict accordance with the Specifications.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

D. Repair or replace damaged sections and finished work that does not comply with these requirements.

E. Remove or hide duct (or shop) installation tags.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection. In addition, locate hangers as follows:

D. Hangers Exposed to View: Threaded rod and angle or channel supports. The use of cable hangers is prohibited. Conceal hangers: The use of cable hangers is prohibited.

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 (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
3. Test for leaks before applying external insulation.
4. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

C. Duct System Cleanliness:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Clean duct system(s) before testing, adjusting, and balancing.

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

3. Clean the following components by removing surface contaminants and deposits:

a. Exhaust fans including fan housings, plenums, scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
b. Dedicated exhaust and ventilation components.

3.7 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units and Downstream of Terminal Units:

a. Pressure Class: Positive 2-inch wg.

2. Ducts Connected between Air-Handling Units and Terminal Units:

a. Pressure Class: Positive 6-inch wg.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Negative 3-inch wg.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting Air:

a. Pressure Class: Negative 3-inch wg.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Negative 2-inch wg.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

b. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "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 or Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in with damper.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees."
a. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
b. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Fire dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

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 installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

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. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: 0.052-inch-thick, galvanized sheet steel 0.063-inch-thick extruded aluminum or 0.052-inch- thick stainless steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum or 0.050-inch-thick aluminum sheet with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Felt, Vinyl foam, Extruded vinyl, mechanically locked or Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Nonferrous metal, Galvanized steel, Plated steel, Stainless steel, Non-metallic or Aluminum.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum or Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Screen Mounting: Rear mounted.
4. Screen Material: Galvanized steel or Aluminum.
5. Screen Type: Bird.
6. 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 Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Pottorff; a division of PCI Industries, Inc.
h. Ruskin Company.
i. Trox USA Inc.
j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized or stainless-steel channels, 0.064-inch minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized Stainless-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel, Stainless steel or Nonferrous metal.
7. Bearings:

a. Oil-impregnated bronze, Molded synthetic or Stainless-steel sleeve.

b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 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 Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. PHL, Inc.
10. Pottorff; a division of PCI Industries, Inc.
11. Prefco; Perfect Air Control, Inc.
12. Ruskin Company.
13. Vent Products Company, Inc.
14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.

2.5 FLANGE 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. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

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. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.7 DUCT-MOUNTED ACCESS DOORS

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 division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
d. 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.

2.8 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. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 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.

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.9 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. Ductmate Industries, Inc.
2. Flexmaster U.S.A., Inc
3. McGill AirFlow LLC.
4. Ward Industries, Inc.; a division 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; polyethylene or aluminized 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/IESNA 90.1.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.

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.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft 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.

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.

G. Install fire dampers according to 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. At outdoor-air intakes.
3. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
4. Adjacent to and close enough to fire dampers, to reset or reinstall fusible links. Access doors for access to fire 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.
5. Upstream 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.

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

S. Install turning vanes in supply duct only.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Backward-inclined centrifugal fans.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.

PART 2 PRODUCTS

2.1 BACKWARD-INCLINED CENTRIFUGAL FANS

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. ABB Fan Group North America.
2. Acme Engineering & Mfg. Corp.
3. Aerovent; a Twin City Fan Company.
4. Airmaster Fan Co.
5. Ammerman; General Resource Corp.

6. Bayley Fans; a division of Lau Industries, Inc.
7. Carrier Corporation.
8. Central Blower Company.
9. Chicago Blower Corporation.
10. Cincinnati Fan.
11. CML Northern Blower Inc.
12. Howden Fan Co.
13. Industrial Air; a division of Lau Industries, Inc.
14. Loren Cook Company.
15. Madison Manufacturing.
16. New Philadelphia Fan Co.
17. New York Blower Company (The).
18. Trane.

D. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

E. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Spun inlet cone with flange.
3. Outlet flange.

F. Backward-Inclined Wheels: Single-width-single-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

G. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

H. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, Ll0 at 50,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, Ll0 at 50,000 hours.

I. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor Size: 1.2.
2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
6. Motor Mount: Adjustable for belt tensioning.

J. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.

2.2 CENTRIFUGAL WALL VENTILATORS

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. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan Company.
3. American Coolair Corp.
4. Ammerman; General Resource Corp.
5. Breidert Air Products.
6. Broan Mfg. Co., Inc.
7. Carnes Company HVAC.
8. Dayton Electric Manufacturing Co.; a division of W. W. Grainger, Inc.
9. Greenheck.
10. Hartzell Fan, Inc.
11. JencoFan; Div. of Breidert Air Products.
12. Loren Cook Company.
13. NuTone Inc.
14. Penn Ventilation.

D. Description: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.

E. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

F. Fan Wheel: Aluminum, steel or cast aluminum hub and wheel with backward-inclined blades.

G. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install units with clearances for service and maintenance.

D. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual volume control and fire dampers in connected ductwork systems are in fully open position.
8. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
9. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Louver face diffusers.
3. Fixed face grilles.

B. Related Sections:

1. Division 23 Section "Air Duct Accessories" for fire and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers

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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. Hart & Cooley Inc.
e. Krueger.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Price Industries.
i. Titus.
j. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Steel.
5. Finish: Baked enamel, color selected by Architect.

6. Face Size: As scheduled.
7. Face Style: Plaque.
8. Mounting: As scheduled.
9. Pattern: Fixed.

B. Louver Face Diffuser

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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. METALAIRE, Inc.
    e. Nailor Industries Inc.
    f. Price Industries.
    g. Titus.
    h. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Steel.
5. Finish: Baked enamel, color selected by Architect.
6. Face Size: As scheduled.
7. Mounting: As scheduled.
8. Pattern: Core style, as scheduled.

2.2 REGISTERS AND GRILLES

A. Fixed Face Grille:

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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

3. Material: Steel or Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Arrangement: Core, as scheduled.

6. Core Construction: Integral.
7. Frame: As scheduled.
8. Mounting: As scheduled.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as 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 and grilles with airtight connections to ducts and to allow service and maintenance of dampers and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

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. Gas-fired, condensing furnaces and accessories complete with controls.

2. Air filters.

3. Refrigeration components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

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 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each furnace 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. Furnace and accessories complete with controls.

b. Air filter.

c. Refrigeration components.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Disposable Air Filters: Furnish two complete sets.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

C. Comply with NFPA 70.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:

a. Furnace Heat Exchanger: 20 years.

b. Integrated Ignition and Blower Control Circuit Board: Five years.

c. Draft-Inducer Motor: Five years.

d. Refrigeration Compressors: 10 years.

e. Evaporator and Condenser Coils: Five years.

PART 2 PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

B. General Requirements for Noncondensing Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

2.2 GAS-FIRED FURNACES, CONDENSING

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. Amana Heating & Air Conditioning; under license to Goodman Company, L.P.

2. Bryant Heating & Cooling Systems; a unit of United Technologies Corp.

3. Carrier Corporation; a unit of United Technologies Corp.

4. Goodman Manufacturing Company, L.P.

5. Lennox Industries, Inc.; Lennox International.

6. Ruud Air Conditioning Division.

7. Trane.

8. YORK; a Johnson Controls company.

B. Cabinet: Galvanized steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.

2. Lift-out panels shall expose burners and all other items requiring access for maintenance.

3. Factory paint external cabinets in manufacturer's standard color.

4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

D. Type of Gas: Natural.

E. Heat Exchanger:

1. Primary: Aluminized steel.

2. Secondary: Stainless steel.

F. Burner:

1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.

2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

G. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.

2. Flame Rollout Switch: Installed on burner box; prevents burner operation.

3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.

J. Accessories:

1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.

2. CPVC Plastic Vent Materials:

a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.

b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.

c. CPVC Solvent Cement: ASTM F 493.

3. PVC Plastic Vent Materials:

a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.

b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.

c. PVC Solvent Cement: ASTM D 2564.

2.3 THERMOSTATS

A. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."

B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.

C. Control Wiring: Balanced twisted-pair cabling complying with requirements for Category 5e in Section 260523 "Control-Voltage Electrical Power Cables."

2.4 AIR FILTERS

A. Disposable Filters: 1-inch- (25-mm-) thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

2.5 REFRIGERATION COMPONENTS

A. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with AHRI 210/240. Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

B. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534/C 534M, Type I, 1 inch thick.

C. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."

D. Air-Cooled Compressor-Condenser Unit:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Hermetically sealed reciprocating type.

a. Crankcase heater.

b. Restrained vibration isolation mounts for compressor.

c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.

e. Refrigerant Charge: R-410A.

3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.

4. Fan: Aluminum-propeller type, directly connected to motor.

5. Motor: Permanently lubricated, with integral thermal-overload protection.

6. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

7. Mounting Base: Polyethylene or concrete pad

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

1. Anchor furnace to substrate to resist code-required seismic acceleration.

C. Controls: Install thermostats at mounting height of 48 inches (1500 mm) above floor.

D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 CONNECTIONS

A. Gas piping installation requirements are specified in "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

b. CPVC Piping: Join according to ASTM D 2846/D 2846M, Appendix.

c. PVC Pressure Piping: Join schedule number ASTM D 1785 PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

4. Slope pipe vent back to furnace or to outside terminal.

D. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled compressor-condenser unit.

1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."

2. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3. 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.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform electrical test and visual and mechanical inspection.

2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.

4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.

2. Verify that access doors move freely and are weathertight.

3. Clean units and inspect for construction debris.

4. Verify that all bolts and screws are tight.

5. Adjust vibration isolation and flexible connections.

6. Verify that controls are connected and operational.

B. Adjust fan belts to proper alignment and tension.

C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

D. Measure and record airflows.

E. Verify proper operation of capacity control device.

F. After startup and performance test, lubricate bearings and adjust belt tension.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

B. Install new filters in each furnace within 14 days after Substantial Completion.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.2 SUBMITTALS

A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace split-system air-conditioning units that fail in materials and workmanship within five 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. Carrier Air Conditioning; Div. of Carrier Corp.
2. Lennox Industries Inc.
3. Mitsubishi Electric Sales Canada, Inc.
4. Mitsubishi Electronics America, Inc.; HVAC Division.
5. Mitsubishi Heavy Industries America, Inc.; Air-Conditioning & Refrigeration Division, Inc.
6. Sanyo Fisher (U.S.A.) Corp.
7. Trane Co. (The); Unitary Products Group.
8. York International Corp.

2.2 EVAPORATOR-FAN UNIT

A. Concealed Unit Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Evaporator Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motor: Multispeed.

E. Filters: 1 inch (25 mm) thick, in fiberboard frames.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

A. Casing steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed scroll type with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Fan: Aluminum-propeller type, directly connected to motor.

E. Motor: Permanently lubricated, with integral thermal-overload protection.

F. Low Ambient Kit.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

B. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

C. Install roof-mounted, compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

3.2 CONNECTIONS

A. Connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

B. Install piping adjacent to unit to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing.

B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

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 applies to all work specified in Divisions 26 and 27.

B. Provide all required materials, labor, equipment, installation, fabrication and testing required for a complete, safe, and fully operational system. System shall include all required materials and features whether specified or shown on drawings or not to comply with applicable codes and authorities having jurisdiction.

C. The electrical installation shall be made in strict conformance with the latest edition and supplements in force at the time of bid opening of the National Electrical Code, the Rules and Regulations of the New Jersey Uniform Construction Code, the applicable Standards of the National Fire Protection Association, and applicable requirements of the Occupational Safety and Health Act of the United States Department of Labor. All materials and equipment employed shall be approved by and bear the label of Underwriters' Laboratories, Inc., where such labeling is made available by any manufacturer for said materials or equipment. All codes and regulations applicable shall be considered as jointly governing and the requirements of either and all will prevail. If it occurs that Drawings conflict with any applicable code, then this Contractor shall immediately bring same to attention of Architect or his representative for resolution.

1.3 DESCRIPTION OF DOCUMENTS

A. The Drawings are generally diagrammatic and indicate the general design and arrangement of the proposed work. Do not scale drawings for the exact location of equipment and work. The exact routing of circuits and final location of all the electrical equipment, lighting fixtures, and other systems, unless specifically dimensioned on the Drawings, shall be subject to building and structural conditions, grid systems, and work of other trades involved in the construction, and subject to the approval of the Architect. The Contractor shall familiarize himself with the Contract Documents, and shall be responsible for the final location of his particular equipment to suit field conditions encountered and to avoid interferences with other trades' work, without extra cost to the Owner or the Architect. The Contractor shall visit the job site to determine the job conditions. The Architect reserves the right to make minor changes in outlet and equipment locations at any time prior to rough-in of the electrical work without incurring any additional costs.

B. Where sizes are not provided for material and equipment, the material and equipment shall be sized in accordance with the latest addition of the National Electrical Code and in accordance with the manufacturer’s recommendations.

1.4 DEFINITIONS

A. The term “finished space” shall mean any space designated for the general or specific use of the occupants.

B. The term “concealed space” shall mean all furred spaces, pipe chases, spaces above finished ceilings, crawl spaces, and other areas not generally accessible to the occupants.

C. The term “electrical space” as used in this division of the specifications shall mean any space designated primarily for the installation of electrical equipment.

D. “Provide” - Furnish and install the specific item, equipment, and/or system.

E. “Furnish” - Supply the specific item, equipment, and/or system.

F. “Install” - Set in position and adjust for use the specific item, equipment, and/or system unless otherwise specifically noted to be installed by others.

G. “Concealed” - Hidden from sight in walls, chases, furred spaces, above ceilings, underground, in concrete, etc.

H. “Exposed” - Not hidden from sight.

I. “Work” - Labor and installation, including materials, equipment, and systems required for completion of all portions of the project.

1.5 CODES AND STANDARDS

A. Following is a list of abbreviations for codes and standards which are referred to in the Specifications. Where such reference is made, the code or standard becomes a part of these Specifications as if the code or standard were included herein. Reference is always to the latest edition of the code or standard unless otherwise specifically noted.

ANSI - American National Standards Institute, Inc.
NFPA - National Fire Protection Association
ASTM - American Society for Testing and Materials
NBS - National Bureau of Standards
NEMA - National Electrical Manufacturers Association
UL - Underwriters' Laboratories, Inc.
NEC - National Electrical Code
NESC - National Electrical Safety Code
IPCEA - Insulated Power Cable Engineers Assn.
IEEE - Institute of Electrical and Electronics Engineers
OSHA - Occupational Safety and Health Act
IES - Illuminating Engineering Society
JIC - Joint Industrial Council

1.6 GUARANTEES AND WARRANTIES

A. This Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into the Contract to be the best of its respective kind, and shall replace all parts at his expense which are defective within one year from final acceptance of the work by the Architect. Items of equipment which may have longer guarantees shall have warranties and guarantees completed, in order, and in effect at the time of final acceptance of the work by the Architect. This Contractor shall furnish all such warranties and guarantees at the time of final acceptance of the work.

B. All work that is not installed in accordance with the Contract Documents shall be repaired or replaced at the direction of the Architect.

1.7 SUBMITTAL

A. Submittals shall be made in accordance with Submittals paragraph in Division 1.

B. Submittal data shall include specification data, such as metal gauges, finishes, optional accessories; even though such equipment and materials may be as specified. In addition, the submittal data shall include performance (certification) data, wiring diagrams where applicable, accurate dimensional data, and a recommended spare parts list. Outline or dimensional drawings alone are not acceptable.

C. No roughing-in or connections shall be done until accepted equipment submittals are in the hands of the Contractor. It shall be this Contractor's responsibility to obtain accepted drawings and to make all connections in the neatest and most workmanlike manner possible. This Contractor shall coordinate with all other Contractors having any connections or roughing-in to the equipment.

D. In general, normal catalog information (with the particular items underlined or otherwise denoted as being the submitted item) will be accepted as submittal data. Installation, operating and maintenance instructions must be that information specifically applicable to the items furnished, which is ordinarily supplied with the equipment to the Owner, for any modifications indicated. Wiring diagrams must be correct for the application. Generalized wiring diagrams, showing alternate methods of connection, will not be acceptable unless all unrelated sections are marked out. Submittal data sheets which indicate several different model numbers, figure numbers, optional accessories, or installation arrangements shall be clearly marked to indicate the specific items of equipment being furnished. Samples and certificates shall be furnished as requested. Submittal data must be complete for each piece of equipment; piecemeal data will not be processed.

E. It shall be noted that acceptance of shop drawings by the Architect applies only to general design, arrangement, type, capacity, and quality. Such acceptance does not relieve the Contractor of the responsibility for furnishing the proper equipment.

F. Corrections or comments made on the submittals during the Architect review do not relieve the Contractor from compliance with the Drawings and Specifications. The Architect's review of submittals is only for general conformance with design concept and general compliance with the information given in the Contract Documents. The Contractor's responsibility includes, but is not limited to, conforming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner.

1.8 SUBSTITUTIONS

A. When this Contractor requests approval of substitute materials and/or equipment, except where under formal alternate proposal, it shall be understood that such substitution, if approved, will be made without cost to the Owner and Architect, regardless of changes. In all cases where substitutions affect other trades, the Contractor offering such substitutions shall reimburse all affected contractors for all necessary changes in their work.

1.9 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance data shall be submitted in accordance with the requirements of Division 01, Operation and Maintenance data.

1.10 RECORD DRAWINGS

A. This Contractor shall submit to the Owner Record Drawings. Drawings shall be identified with the Contractor's name, the date, and title "RECORD DRAWINGS".

1.11 PROJECT CONDITIONS

A. Interruption of Existing Electrical Services: 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 Architect no fewer than seven days in advance of proposed interruption of electrical services.
2. Indicate method of providing temporary electrical service if required. Contractor is responsible for providing all temporary electrical services.
3. Do not proceed with interruption of electrical service without Architect's and Owner's written permission.
4. Comply with NFPA 70E.

1.12 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways and cables will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate sleeve selection and application with selection and application of specified firestopping.

C. The Contractor shall coordinate with all other contractors in locating conduit, light fixtures, boxes, sleeves, and equipment in order to avoid conflict with all other trades' work. No extra compensation will be allowed to cover the cost of relocating light fixtures, conduit, boxes, sleeves, or other electrical equipment found encroaching on space required by others.

1.13 ABBREVIATIONS

A. Abbreviations may be used and indicated throughout the Specifications and Drawings, and will conform to the following list:

A or AMP	AMPERES, OR AMPACITY
AFF	ABOVE FINISHED FLOOR
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMB	COMBINATION
CU	COPPER
EC	ELECTRICAL CONTRACTOR
EM	ON EMERGENCY CIRCUIT
EMT	ELECTRICAL METALLIC TUBING
FDS	FUSIBLE DISCONNECT SWITCH
GC	GENERAL CONTRACTOR
G	GREEN GROUNDING CONDUCTOR
GND	GROUND
HP	HORSEPOWER
JB	JUNCTION BOX
KVA	KILOVOLT AMPERES
KW	KILOWATTS
MC	MECHANICAL CONTRACTOR
MTR	MOTOR
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NIC	NOT IN THIS CONTRACT
NL	NIGHT LIGHT
Ø	PHASE
PNL	PANEL
PVC	POLYVINYLCHLORIDE
RM	ROOM
STD	STANDARD

PART 2 PRODUCTS

2.1 GENERAL

A. Material and equipment shall be furnished as specified in this section and each individual electrical section of these Specifications and shall be in strict accordance with applicable ANSI, NBS, ASTM, NESC, NEMA, IEEE, IPCEA, UL, NEC, OSHA and NFPA standards, codes, and specifications. Applicable codes, standards, and manufacturers' products referred to in these Specifications shall establish minimum requirements for materials and equipment furnished for this installation.

B. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

C. New material and equipment shall be provided for the entire project, unless noted otherwise.

2.2 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.3 Bolting shall be carbon steel conforming to ASTM A-307 with heavy hexagonal nuts.

2.4 Angles, Channels, Beams, Bars and Rods shall be steel conforming to ASTM A-36 as applicable.

2.5 FIRESTOPPING

A. At penetrations of fire walls provide Link-Seal “Pyro-pac”, 3M “System 7904”, or accepted equal, fire barrier penetration sealing system. The sealing system shall have a 3-hour rating when tested in accordance with the provisions of ASTM E-119. Installation of penetration sealing systems shall be in accordance with manufacturer’s instructions.

2.6 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such

a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. Any electrical box, device, conduit, or enclosure installed in any fire rated column, wall, or ceiling shall not reduce the fire rating of said column or wall. The Contractor providing the device, box, conduit, or enclosure shall provide the required material to maintain the fire rating of the column, wall, or ceiling.

G. Provide cover plates where conduit and raceways pass through floor, ceiling, or walls and are exposed in finished rooms. Flanges shall fit snugly and shall be sized to cover the openings. All escutcheons shall be chromium plated wing type with fastening screws.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways or cables penetrate concrete or masonry walls, or fire-rated wall assemblies.

B. Concrete Walls: Install sleeves for penetrations unless core-drilled holes are used.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated wall assemblies unless openings compatible with firestop system used are fabricated during construction of wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.

I. Fire-Rated-Assembly Penetrations: Maintain fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.

J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves caulked watertight.

3.3 EQUIPMENT CONNECTION AND WIRING

A. Unless specifically noted otherwise on the Drawings or elsewhere in the Specifications, all wiring and all equipment connections shall be provided by the Electrical Contractor, including equipment requiring electrical services furnished under other sections of the Specifications or by the Owner.

B. The Electrical Contractor shall furnish and install all disconnect switches, NEC circuit protection, motor controllers, relays, and devices as required for all equipment to provide complete and operable electrical systems, unless the items are specifically noted elsewhere as being provided with, or as part of, the equipment.

C. Electrical Contractor shall verify horsepower, voltage, phase, starting requirements, quantity of wires, and wattage of all equipment which requires electrical connections before equipment purchase or rough-in, and shall install feeders, branch circuits, and motor starting equipment and protection which are suitable in all respects for connection to, and operation with, the equipment furnished. Exact location of all equipment which requires electrical connection shall be verified with the equipment installer before rough-in.

3.4 EQUIPMENT INSTALLATION

A. All equipment shall be installed at locations indicated and oriented so as to be easily accessible.

B. Assembly and installation of equipment shall be in strict accordance with manufacturer's installation instructions.

C. Cutting, Fitting, and Patching

1. The Electrical Contractor shall do all cutting and drilling of masonry, steel, wood, or iron work and all fitting necessary for the proper installation of all electrical equipment and materials included in the Specifications or governed thereby.
2. No cutting or drilling of the structure, of any kind, shall be done without first obtaining permission from the Architect. All cutting and drilling shall be done under the supervision of the Contractor in strict accordance with instructions furnished by the Architect.
3. All patching and finishing shall be done by workmen skilled in the trades involved.

3.7 PERMITS, CERTIFICATES, LAWS AND ORDINANCES

A. The Electrical Contractor shall, at his own expense, procure all permits, certificates, and licenses required of him by law for the execution of his work. He shall comply with all Federal, State, and local laws, ordinances, rules and regulations relating to the performance of the work.

B. Following completion, a certificate of approval shall be secured from the local code enforcement authority and delivered to the Architect.

3.8 INSPECTION

A. The Electrical Contractor shall, at his own expense, furnish electrical inspection as required by the local code enforcing agency, when applicable. The Contractor shall notify the Electrical Inspector in writing upon the start of the job and a copy of the notice shall be sent to the Architect. The Contractor shall furnish certificates of final approval by the Electrical Inspection Bureau and final payment shall be withheld until he has presented the Architect with the aforementioned certificates of approval.

3.9 PAINTING

A. Refinish surfaces marred or damaged by electrical work to original or specified condition.

B. Replace marred or discolored factory, multiple coat, baked on finish surfaces. Minor inconspicuous scratches may be “touched-up”.

C. The following items do not require painting.

1. Equipment with a factory baked on finish.
2. Receptacle and switch cover plates.
3. Faceplates of instruments, equipment, and control panels.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Sections include the following:

1. Division 26 Sections:

a. “Common Work Results for Electrical”
b. “Identification for Electrical Systems”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Wire and cable shall be manufactured with material selection tests as described in ASTM D3291 and EN 50497 to prevent plasticizer exudation from PVC insulated and sheathed cables.

PART 2 PRODUCTS

2.1 CONDUCTORS AND CABLES

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 Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Carol Cable.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal –clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

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. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Minimum conductor size shall be No. 12 AWG.

B. Branch Circuits: Copper. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Minimum conductor size shall be No. 12 AWG.

C. Control Circuits: Copper. Solid or stranded for No. 10 AWG and smaller. Minimum conductor size shall be No. 14 AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, type MC, may be used for wiring within rooms. Metal-clad cable, type MC, shall not be used for homeruns.

E. Class 1 Control Circuits: Type THHN-THWN, in raceway.

F. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls and ceilings, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems".

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems".

G. No wiring shall be pulled until construction is such that there is no danger of moisture entering open raceways. Protect all openings with caps or plugs until final connections are made. Conduit shall be swabbed clean before pulling conductors.

H. No thermoplastic conductors shall be pulled through raceways at ambient temperatures below 33^{o}F.

I. All insulated bushings shall be installed before pulling conductors.

J. All wiring in panel gutters, pull boxes, and other accessible enclosures shall be tied and bundled with cable ties.

K. Wiring shall be installed continuously between terminal points indicated or dictated by field conditions without intermediate splices or taps unless specifically authorized by the Architect. Splices shall be made only in junction or terminal boxes.

L. Feeder cables shall be spliced only at tap points. Splices of any other nature shall not be permitted.

M. Conductors shall not be subject to pulling tension in excess of 50 percent of yield strength of conductor. Pulling lugs shall be attached to conductor with a sleeve or grip over the cable sheath to prevent slipping the insulation.

N. Where terminals and splices are taped with insulation tape, apply a minimum of two layers of electrical tape, half-lapped.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. All joints between conductors shall be made with wire connectors. Splices shall be in boxes and shall be accessible. Branch circuit conductors #10 AWG and smaller shall be spliced together using properly sized and listed spring type insulated conductors (i.e. wire nut) Conductors #8 AWG and larger shall be spliced using a non-insulated compression type sleeve or split-bolt connector with tape covering.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

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 systems and equipment.

B. Related sections include the following:

1. Division 26 Section:

a. “Common Work Results for Electrical”

1.3 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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 2 inches in cross section, with 9/32-inch drilled and tapped holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 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.

PART 3 EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid copper conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Bus: Install in electrical and IT equipment areas, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch minimum from wall, 6 inches above finished floor unless otherwise indicated.

C. Conductor Terminations and Connections:

1. Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Panelboards: Provide ground bushing on each incoming feeder conduit and connect to equipment ground bus.

C. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports.

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. 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.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

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.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. 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 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate installation of equipment supports, and roof penetrations.

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. 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. 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.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. 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) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. 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) 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.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

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 as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other 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.
2. Whenever possible, conduit shall be top mounted.
3. Each conduit shall be individually clamped to supports.
4. Parallel runs of conduit shall be grouped and fastened to walls with wall brackets of steel channel or knee-braced angles.

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 above suspended ceilings and for fastening raceways to trapeze supports.

E. Single runs of conduit shall be fastened to walls with one-hole straps or conduit clamps and to beams and trusses with beam clamps.

F. Peforated band iron, piano wire, or steel wire hangers will not be permitted as conduit hangers or supports. Conduit shall not be hung from wire supporting ceiling grid systems.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. 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 Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.

4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount panelboards, disconnect switches, pull and junction boxes, and other devices on slotted-channel racks attached to substrate by means that meet anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings and boxes for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section “Common Work Results for Electrical”.
2. Division 26 Section “Hangers and Supports for Electrical Systems” for raceway and box supports.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. GRC: Galvanized rigid steel conduit.

D. LFMC: Liquidtight flexible metal conduit.

1.4 SUBMITTALS

A. Product Data: For conduit and boxes.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of conduits with other work of the Project.

PART 2 PRODUCTS

2.1 METAL CONDUIT AND TUBING

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. AFC Cable Systems, Inc.
2. Alflex Inc.

3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel compression type. Set screw and indention type fittings are not allowed.
2. Fittings for rigid steel conduit shall be threaded.

G. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 BOXES

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. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: EMT.
3. Connection to Vibrating Equipment: LFMC.
4. Boxes Aboveground: NEMA 250, Type 3R. Cast malleable iron with threaded hubs and vellumoid gasket.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment: FMC, except use LFMC in damp or wet locations.
4. Boxes: NEMA 250, Type 1.

a. Minimum outlet box depth shall be 2 1/8 inches.
b. Four-inch octagonal outlet boxes shall be provided for wall and ceiling mounted fixtures. Outlet boxes shall be provided with fixture studs as required for mounting fixture.
c. Four-inch square outlet boxes shall be provided for switches and convenience outlet boxes. A 4 inch by 2 1/8-inch handy box may be used for these devices when only one raceway enters the outlet box.
d. Four-inch square outlet boxes shall be provided for voice outlets, data outlets, and other special system outlets unless larger outlet boxes are specified elsewhere.
e. Square cornered boxes shall be provided in block and brick wall construction.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 12 inches away from parallel runs of flues and uninsulated steam or hot-water pipes, 6 inches if crossing. Where lines are insulated, conduit parallel or crossing shall be at least 2 inches away. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation. All conduit shall be swabbed and cleaned before pulling wire.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems". Conduit shall be securely fastened in place within 3 feet of each outlet box, junction box, cabinet, or fitting and shall be supported at least every 10 feet. No conduit shall be supported by the equipment to which it is connected.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

F. Conceal conduit and EMT within finished walls and ceilings, unless otherwise indicated.

G. Threaded Conduit Joints, Exposed to Wet, Damp, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

J. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for motors.

   1. Use LFMC in damp or wet locations.

K. 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.

L. Metallic conduit systems shall be electrically continuous in their entirety.

M. Outlet boxes shall be provided for all devices. Pull boxes and junction boxes shall be provided at all points of splicing and tapping.

N. Boxes shall not be installed back-to-back in any wall, but shall be staggered at least 12 inches apart.

O. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry block and with screws or welded studs on steel work.

P. Threaded studs driven in by powder charge and provided with lock washers and nuts, or nail-type nylon anchors, may be used in lieu of wood screws, expansion shields or machine screws.

Q. Outlet boxes in lay-in ceilings shall be supported by bar hangers anchored to the ceiling construction.

R. Connections between outlet boxes on the opposite sides of a wall shall be made with conduit employing the use of two 90-degree bends from box to box.

S. All boxes shall be accessible.

T. Conduit shall be run with smooth, easy bends. Exposed conduit shall be run parallel or perpendicular to walls, ceilings, beams, and columns. Concealed conduit may be run at angles other than parallel or perpendicular to building lines but shall be grouped in a neat and workmanlike manner. Dissimilar angles and crisscross arrangement will not be acceptable.

U. Conduit bends and elbows shall be long-sweep, large radii when required by cable manufacturer.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings and finishes are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

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 aluminum cable trays and accessories.

B. This section covers and applies to all work specified in Division 26.

C. Related sections include the following:

1. Division 7 Section “Penetration Firestopping”.
2. Division 26 Sections:

    a. “Common Work Results for Electrical”
    b. “Grounding and Bonding for Electrical Systems”
    c. “Hangers and Supports for Electrical Systems”

1.3 SUBMITTALS

A. Product Data: 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 tray, 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.

C. Field quality-control reports.

D. Operation and Maintenance Data: For cable trays to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store indoors to prevent water or other foreign materials from staining or adhering to cable tray. Unpack and dry wet materials before storage.

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. Chalfant Manufacturing Company.
2. Cooper B-Line, Inc.
3. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
4. GS Metals Corp.; GLOBETRAY Products.
5. MONO-SYSTEMS, Inc.
6. MPHusky.
7. PW Industries.

2.2 MATERIALS AND FINISHES

A. Cable Trays, Fittings and Accessories: Aluminum, complying with NEMA VE 1, Aluminum Association's Alloy 6063-T6 for rails, rungs, and cable trays, and Alloy 5052-H32 or Alloy 6061-T6 for fabricated parts; with chromium-zinc, ASTM F 1136 or Type 316 stainless-steel splice-plate fasteners, bolts, and screws

B. Cable Trays, Fittings, and Accessories: Stainless steel, Type 316, complying with NEMA VE 1.

C. Sizes and Configurations: Refer to the Drawings for specific requirements for types, sizes and configurations.

1. Cable tray shall be ladder type with 12 inch rung spacing.
2. Fittings radius shall be 24 inches.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows and other fittings as indicated, of same materials and finishes as cable tray.

1. Siderails of straight sections and fittings shall be compatible so that standard splice plates can be used to join sections and fittings.
2. Splice plates shall be of wedge lock design, using four square neck carriage bolts and serrated flange locknuts.
3. Laminated straps shall be utilized across expansion joints.

B. Barrier Strips: Same materials and finishes as cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.4 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. Materials and fastening are specified in Division 26 Section "Identification for Electrical Systems".

2.5 SOURCE QUALITY CONTROL

A. Perform design and production tests according to NEMA VE 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.

B. Remove burrs and sharp edges from cable trays.

C. Fasten cable tray supports to building structure.

1. Place supports so that spans do not exceed maximum spans on schedules.
2. 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.
3. Support bus assembly to prevent twisting from eccentric loading.
4. Locate and install supports according to NEMA VE 1.

D. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.

E. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA VE 1. Space connectors and set gaps according to applicable standard.

F. Make changes in direction and elevation using standard fittings.

G. Make cable tray connections using standard fittings.

H. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping".

I. Workspace: Install cable trays with enough space to permit access for installing cables.

J. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.

3.2 CABLE INSTALLATION

A. Install cables only when cable tray installation has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties as recommended by NEMA VE 2. 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. On vertical runs, fasten cables to tray every 18 inches. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

3.3 CONNECTIONS

A. Ground cable trays according to manufacturer's written instructions.

B. Install an insulated equipment grounding conductor with cable tray, in addition to those required by NFPA 70.

3.4 FIELD QUALITY CONTROL

A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.

B. Report results in writing.

3.5 PROTECTION

A. Protect installed cable trays.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
2. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.

END OF SECTION

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. Identification for conductors and control cables.
2. Warning labels and signs including arc flash labeling.
3. Equipment identification labels.
4. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with NFPA 70E.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535 for arc flash labels.

E. Comply with OSHA requirements for electrical labeling.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES".
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES".

2.3 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed.

1. Equipment Label Text Height: Equipment name 3/16 inch; all other text 1/8 inch.
2. Equipment Label Minimum Size: 2 inch by 4 inch.
3. Equipment Label shall identify equipment name, equipment ampere and voltage ratings, and circuit feeding equipment.
4. Labels for equipment shall be white letters on black background.

B. Stenciled Legend: In nonfading, waterproof black ink.

2.4 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. 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.

2.5 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. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, 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 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 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to

prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

B. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

C. 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.

D. 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. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   b. 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 self-adhesive, engraved, laminated acrylic or melamine label.
   b. Enclosed switches.
   c. Enclosed controllers.
   d. Contactors.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches.
3. Wall-box dimmers

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions. Refer to Division 01 Operation and Maintenance Data.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).

3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Receptacles shall be heavy duty industrial grade type with one piece brass strap with integral ground.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper; 5361 (single), 5362 (duplex).
b. Hubbell; HBL5361 (single), HBL5362 (duplex).
c. Leviton; 5361 (single), 5362 (duplex).
d. Pass & Seymour; 5361A (single), 5362A (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper; XGF20.
b. Hubbell; GF5362
c. Leviton; 7599
d. Pass & Seymour; 2094.

2.4 SNAP SWITCHES

A. Comply with NEMA WD1 and UL 20. Switches shall be heavy duty industrial grade with silver cadmium oxide contacts and rated 1 HP at 120v, and 2 HP at 277v.

B. Switches: 120/277 V, 20 A:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper 2221 (single pole), 2223 (three way).
b. Hubbell HBL 1221 (single pole), HBL 1223 (three way).
c. Leviton: 1221-2 (single pole), 1223-2 (three way).
d. Pass & Seymour: PS20AC1 (single pole), PS20AC3 (three way).

2.5 WALLBOX DIMMERS

A. Dimmers Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. 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.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished stainless steel 302/304.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, thermoplastic with lockable cover, and listed and labeled weather tight while-in-use.

2.7 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. Tighten unused terminal screws on the device.
8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

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 enclosed switches.

B. Related Sections include the following:

1. Division 26 Sections:

a. “Enclosed Switches”.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. 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.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data", include the following:

1. 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.

1.4 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.

1.5 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.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Mersen.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages. Selections based on characteristics published by Bussman.

1. All fuses shall be current limiting with 200,000 amperes interrupting capacity, and shall be certified by Underwriter’s Laboratories, to have interrupting capacities adequate and proper for the system in which they are placed.
2. Class RK5: Standard dimension; dual-element, time delay type, Bussman FRN-R and FRS-R.
3. Small Dimension: Time delay type, Bussman FNQ-R.

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. UL Class RK-5 fuses shall be installed in all fusible switches.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. No fuses shall be installed in the equipment until the installation is complete, including thorough cleaning, tightening of all electrical connections and inspection of all ground and grounding conductors. Fuses shall not be shipped installed in equipment and shall not be shipped to job site until equipment and systems are ready to be energized.

C. A fuse identification label showing the fuse size and type shall be placed inside the door of each fused switch.

D. Provide fuse reducers where fuse clips are spaced larger than the fuse size required.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

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. Enclosures.

B. Related sections include the following:

1. Division 26 Sections:

a. “Hangers and Supports for Electrical Systems”.
b. “Identification for Electrical Systems”.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, 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. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. 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. Include plans, elevations, sections, details, and attachments to other work.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Operation and Maintenance Data: For enclosed switches to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches.
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.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches, including clearances between enclosures, 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 NFPA 70.

1.5 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.

1.6 COORDINATION

A. Coordinate layout and installation of switches, 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. 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. 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.

B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. 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. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Compression type, suitable for number, size, and conductor material.

2.2 ENCLOSURES

A. Enclosed Switches: 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches 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 with tops at uniform height unless otherwise indicated and by boiling units to wall or mounting on lightweight structural steel channels bolted to wall. For enclosed switches not at walls, provide freestanding racks complying with Division 26 “Hangers and Supports for Electrical Systems.”

B. Install fuses in fusible devices and leave in the “off” position after final installation and testing.

C. Switches shall be properly rated for the voltage of the system to which they are connected, and shall have ampacity and horsepower rating corresponding to the load served.

D. Install overcurrent protective devices not already factory installed.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "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. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch, component, connecting supply and feeder.

2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

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 the following types of LED luminaires:

1. LED Luminaires.
2. Materials.
3. Finishes.
4. Luminaire support.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. LED: Light-emitting diode.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
5. Photometric data and adjustment factors based on laboratory tests.

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

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 NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and ceiling system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

B. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. Standards:

1. ENERGY STAR certified.
2. Recessed luminaires shall comply with NEMA LE 4.

C. Lamps dimmable from 100 percent to 0 percent of maximum light output.

D. Internal driver.

E. Nominal Operating Voltage: As indicated.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.2 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

1. Operating at nominal voltage of 120 V. ac.
2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.

2.3 MANUFACTURERS

A. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selections:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.4 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. Factory-Applied Labels: Comply with UL 1598. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.5 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece.

2.6 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems".

B. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

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 luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Luminaire installed in or on lay-in ceiling system shall be supported independently of the ceiling system grid with No. 14 galvanized support wires at two opposite corners of the fixture from the building structural system.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in wall.
2. Do not attach luminaires directly to gypsum board.

G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 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.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

END OF SECTION

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. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications equipment racks and cabinets.
4. Telecommunications service entrance pathways.
5. Grounding.

B. Related sections include the following:

1. Division 26 Sections:

a. “Common Work Results for Electrical”
b. “Grounding and Bonding for Electrical Systems”
c. “Cable Trays for Electrical Systems”
d. “Identification for Electrical Systems”.

2. Division 27 Sections:

a. "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
b. "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. LAN: Local area network.

C. RCDD: Registered Communications Distribution Designer.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.7 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

PART 2 PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
2. Support brackets with cable tie slots for fastening cable ties to brackets.
3. Lacing bars, spools, J-hooks, and D-rings.
4. Straps and other devices.

C. Cable Trays: Comply with requirements in Division 26 Section "Cable Trays for Electrical Systems”.

D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems”. Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 4 inch square, and 2-1/8 inches deep. Provide all trim rings required to install in wall.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section “Rough Carpentry”.

2.3 EQUIPMENT FRAMES

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. ADC.
2. Aim Electronics; a brand of Emerson Electric Co.
3. AMP; a Tyco International Ltd. company.
4. Cooper B-Line, Inc.
5. Hubbell Premise Wiring.
6. KRONE Incorporated.
7. Leviton Voice & Data Division.
8. Middle Atlantic Products, Inc.
9. Nordex/CDT; a subsidiary of Cable Design Technologies.
10. Ortronics, Inc.
11. Panduit Corp.
12. Siemon Co. (The).

B. General Frame Requirements:

1. Distribution Frames: Freestanding, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

2. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
3. Finish: Manufacturer's standard, baked-polyester powder coat.

C. Floor-Mounted Racks: Modular-type, four-post, steel construction.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
2. Baked-polyester powder coat finish.

D. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.4 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Rack mounting.
2. Six, 15-A, 120-V ac, NEMA WD 6, Configuration 5-15R receptacles.
3. LED indicator lights for power and protection status.
4. LED indicator lights for reverse polarity and open outlet ground.
5. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
6. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
7. Cord connected with 15-foot line cord.
8. Rocker-type on-off switch, illuminated when in on position.
9. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
10. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.

2.5 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. UPS shall be rated at 120 volt plug-in input with 120 volt, 2200VA line interactive output and rack mount housing. Provide three load banks, eight outlets.

B. UPS shall be provided with resettable overload protection circuit breaker and eight minute full load restore.

C. Provide one UPS per rack provided, unless noted otherwise.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.7 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.2 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping". Comply with TIA/EIA-569-A, Annex A, "Firestopping".

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.3 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems". For fire-

resistant plywood, do not paint over manufacturer's label. Comply with requirements in Division 09 Section “Interior Painting” for painting backboards.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.

C. Labels shall be preprinted or computer-printed type.

END OF SECTION

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. Pathways for Owner provided cabling.

B. Related Sections include the following:

1. Division 26 Sections:

a. “Common Work Results for Electrical”.
b. “Raceways and Boxes for Electrical Systems”.
c. “Identification for Electrical Systems”.

2. Division 07 Section “Penetration and Firestopping”.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.

1.4 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard. System performance shall be 10 Gigabit, minimum.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. 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 side 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. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports. Provide three printed copies and three digital copies.

F. Provide final record drawings indicating location of each communications device and cable.

G. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

F. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide Corning MIC 250 series cable or comparable products by one of the following:

1. Backbone Optical Fiber Cable, Patch Cables, and Connecting Hardware.

a. Belden CDT Inc., Electronics Division
b. Berk-Tek; a Nexans Company
c. General Cable Technologies Corporation
d. Mohawk; a division of Belden CDT
e. Superior Essex Inc.
f. SYSTIMAX Solutions; a Commscope Inc. brand

2.2 OPTICAL FIBER CABLE

A. Description: Multimode, 50/125-micrometer OM3, and single mode, gel-free, nonconductive, loose tube (12 per buffer tube), optical fiber cable with number of strands as indicated.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
b. Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.

5. Maximum Attenuation:

a. Multimode: 3.50 dB/km at 850nm; 1.5 dB/km at 1300 nm.
b. Singlemode: 0.40 dB/km at 1310nm; 0.30dB/km at 1550 nm.

6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300nm.

a. Multimode: 160 MHZ-Km at 850 nm; 500 MHZ-Km at 1300 nm.
b. Singlemode: Dispersion unshifted, matched-clad, zero water peak.

B. Jacket:

1. Jacket Color:

a. Multimode: Aqua for 50/125-micrometer.
b. Singlemode: Yellow.

2. Cable cordage jacket, fiber, unit and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

C. Breakout Kits and splice trays for terminations shall be provided by the same manufacturer as cable.

2.3 OPTICAL FIBER CABLE HARDWARE

A. Subject to compliance with requirements, provide Corning CCH series equipment or comparable products by one of the following:

1. Backbone Optical Fiber Cable, Patch Cables, and Connecting Hardware.

a. Hubbell Premise Wiring
b. Leviton Voice & Data Division
c. Panduit Corp.
d. Siemon Co. (The)
e. SYSTIMAX Solutions; a Commscope Inc. brand

B. Patch Panels: Modular panels housing multiple-numbered, duplex SC cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths with SC style connectors and ceramic ferrules.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.

2.4 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems".

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A and with requirements in Division 26 Section "Cable Trays for Electrical Systems”.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings”. Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF BACKBONE CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices”.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable”. Monitor cable pull tensions.

C. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

3.5 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping. "Comply with TIA/EIA-569-A, Annex A, "Firestopping".

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems".

B. Comply with requirements in Division 27 Section "Communications Horizontal Cabling" for cable and asset management software.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination, where it is accessible in a cabinet or junction or outlet box, at each patch panel, and elsewhere as indicated.
2. Label shall include room number; rack number; patch panel number; and patch panel connector number.

F. Each patch panel and each patch panel connector shall be labeled.

G. Labels shall be self-laminating type and shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 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. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
b. Link End-to-End Attenuation Tests:

1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION

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. Pathways.
2. UTP cabling.
3. Cable connecting hardware and patch panels.
4. Telecommunications outlet/connectors.
5. Cabling system identification products.
6. Cable management system.

B. Related Sections include the following:

1. Division 26 Sections:

a. “Common Work Results for Electrical”.
b. “Raceways and Boxes for Electrical Systems”.
c. “Cable Trays for Electrical Systems”
d. “Identification for Electrical Systems”.

2. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

H. RCDD: Registered Communications Distribution Designer.

I. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link", a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more that one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard. All components shall meet or exceed ANSI/TIA Category 6 performance.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

    a. Patch panels.
    b. Patch cords.

4. Patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports. Provide three printed copies and three digital copies.

F. Provide final record drawings indicating location of each communications device and cable.

G. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

F. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.
2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.

PART 2 PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Cable Trays: Comply with requirements in Division 26 Section "Cable Trays for Electrical Systems".

D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems". Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 4 inch square, and 2-1/8 inches deep. Provide all trim rings required to install in wall.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide SYSTIMAX Category 6 GigaSPEED XL cabling or comparable products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. Mohawk; a division of Belden CDT.
4. Nordex/CDT; a subsidiary of Cable Design Technologies.
5. Superior Essex Inc.

B. Description: 100-ohm, 4-pair UTP covered with a thermoplastic jacket. Jacket shall be blue for data cabling and yellow for voice cabling

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, General Purpose: Type CM or CMG.
    b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    d. Communications, Limited Purpose: Type CMX.
    e. Multipurpose: Type MP or MPG.
    f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    g. Multipurpose, Riser Rated: Type MPR or MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide SYSTIMAX GigaSPEED XL series products or comparable products by one of the following:

1. Hubbell Premise Wiring.
2. Leviton Voice & Data Division.
3. Nordex/CDT; a subsidiary of Cable Design Technologies.
4. Panduit Corp.
5. Siemon Co. (The).
6. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools, Category 6 performance. Cables shall be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated.

D. Patch Cords: Factory-made, four-pair cables in lengths indicated; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide SYSTIMAX MGS400 series outlets or comparable product by one of the following:

1. Hubbell Premise Wiring.
2. Leviton Voice & Data Division.
3. Nordex/CDT; a subsidiary of Cable Design Technologies.
4. Panduit Corp.
5. Siemon Co. (The).
6. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Jacks: Category 6, 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1. Universal design and label shall support T568 A & B wiring.

C. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices".
2. For use with snap-in jacks accommodating any combination of UTP work area cords.
3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section "Identification for Electrical Systems".

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems”.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. In equipment rooms, provide a patch cords for each horizontal work area cable terminated on patch panel. Turn patch cords over to Owner for connecting work area outlets to electronic equipment.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7 and with requirements in Division 26 Section "Cable Trays for Electrical Systems”.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings”. Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible. Conduit system for cabling shall not contain more than two 90 deg. bends or the equivalent. Provide pullboxes as required.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices”.

3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Each cable shall be bundled with like kinds and routed through appropriate raceway or cable tray system.
7. Utilize tie wraps or other approved materials to form bundles and to secure cabling. Do not damage cables. No unattached cabling / bundles shall be allowed.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable". Monitor cable pull tensions.
14. Cabling shall be separately terminated on its designated patch panel in the equipment rack. Data cabling shall be terminated onto data patch panels. Voice cables shall be terminated onto voice patch panels. Data cabling for CCTV shall be terminated onto CCTV data patch panels.
15. Cabling shall be terminated in numerical order with the lowest number first.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
3. Connect wiring in T568 B configuration.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a conduit, cable tray, or pathway a minimum of 8 inches above ceilings by J-hook cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields. The fields shall be designated as “D” for data, “V” for voice, or “C” for CCTV camera data.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping”.

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping”.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable shall reflect as-built conditions.

B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

D. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination, where it is accessible in a cabinet or junction or outlet box, at each patch panel, and elsewhere as indicated.
2. Label shall include room number and shall be identified as data, voice, or CCTV; IDF Room Number; rack number, patch panel identifier, patch panel jack number; workstation location room number; and outlet box/jack number within room.

E. Each jack within each telecommunication outlet shall be labeled.

F. Each patch panel and each patch panel jack shall be labeled.

G. Labels shall be self-laminating type and shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent and are viewable from 360 degrees.

3.8 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. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

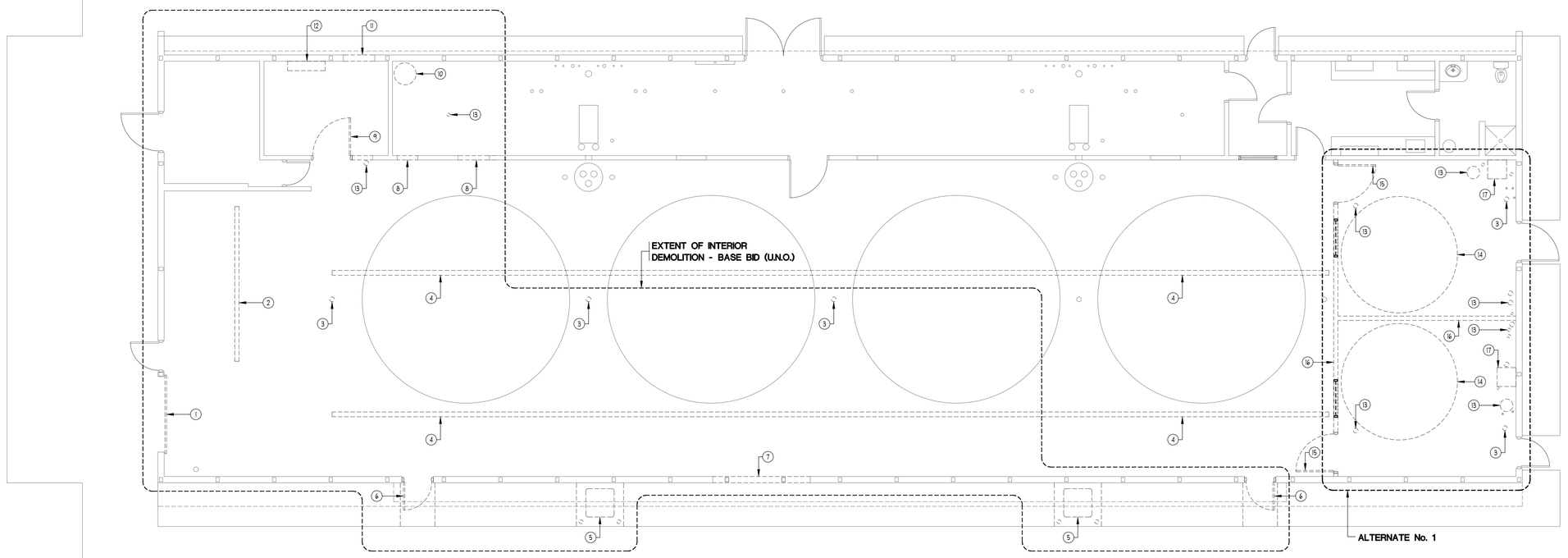
    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION



DEMOLITION PLAN - BASE BID

SCALE: 3/16" = 1'-0"

1

ALTERNATE No. 1

IN AREA SHOWN, REMOVE EXISTING WALL CONSTRUCTION, INCLUDING DOORS, FRAMES AND WINDOWS, TANKS, CONCRETE PADS, PVC PIPING, ETC AS REQUIRED AND AS SHOWN. INFILL AREA OF TANKS WITH CRUSHED STONE, COMPACT AND PROVIDE A NEW 4" CONC. S.O.G. W/ 6x6 10/10 WWF OVER 10 MIL POLY VAPOR BARRIER, NEW SLAB TO ALIGN W/ EXISTING.

KEYNOTES:

1. REMOVE EXISTING OVERHEAD COILING DOOR COMPLETE AND TURN OVER TO OWNER FOR FUTURE RELOCATION. SEE ALTERNATE NO. 3 FOR ADDITIONAL INFORMATION.
2. REMOVE EXISTING TRENCH DRAIN; SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION.
3. REMOVE EXISTING FLOOR DRAIN; SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION.
4. REMOVE EXISTING OVERHEAD CRANE/RAIL SYSTEM COMPLETE AND TURN OVER TO OWNER/STORE IN BLDG AS DIRECTED BY OWNER.
5. REMOVE EXISTING CONDENSING UNIT, CONC. PAD AND BOLLARDS COMPLETE. SEE MECH. DWGS. FOR ADDITIONAL INFORMATION. RESTORE GRADE/ PROVIDE FILL AS REQ'D.
6. REMOVE EXISTING DOOR, FRAME AND HARDWARE COMPLETE; REMOVE EXIST CONC. WALK IN AREA OF DOOR AS SHOWN.
7. REMOVE EXISTING WALL CONSTRUCTION AS REQUIRED FOR INSTALLATION OF NEW ALUMINUM & GLASS ENTRY SYSTEM. EXISTING SIDING TO BE RELOCATED.
8. REMOVE EXISTING LOUVER AND INFILL WALL CONSTRUCTION AS REQUIRED OR PROVIDE NEW DOOR OPENING; SEE FLOOR PLAN.
9. REMOVE EXISTING DOOR, FRAME, HARDWARE AND ADJACENT WALL CONSTRUCTION AS REQUIRED FOR INSTALLATION OF NEW DOOR AND SIDELITE.
10. REMOVE EXISTING WELL TANK AND ALL ASSOCIATED CONSTRUCTION COMPLETE. SEE MEP DRAWINGS FOR ADDITIONAL INFORMATION.
11. REMOVE EXISTING WALL CONSTRUCTION AS REQUIRED FOR INSTALLATION OF NEW WINDOW UNIT.
12. REMOVE EXISTING WALL MTD HVAC UNIT COMPLETE AND PATCH WALL CONSTRUCTION TO MATCH EXISTING. SEE MECH. DWGS. FOR ADDITIONAL INFORMATION.
13. REMOVE PVC PIPE FLUSH W/ EXIST CONC. SLAB ON GRADE; INFILL PIPE OPENING AS REQUIRED FOR INSTALLATION OF FLOOR LEVELING COMPOUND. SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION. TYPICAL FOR ALL PVC FLOOR PENETRATIONS IN AREA OF WORK NOT DESIGNATED TO REMAIN.
14. REMOVE EXISTING TANK COMPLETE; INFILL W/ CRUSHED STONE, COMPACT AND PROVIDE NEW 4" CONC. S.O.G. FLUSH W/ EXIST FLOOR SLAB.
15. REMOVE EXISTING DOOR, FRAME AND ALL ASSOCIATED HARDWARE COMPLETE.
16. REMOVE EXISTING WALL CONSTRUCTION COMPLETE. PATCH EXISTING CONSTRUCTION DESIGNATED TO REMAIN AS REQUIRED FOR INSTALLATION OF NEW FINISHES.
17. REMOVE EXISTING CONC. PAD; PATCH EXISTING CONSTRUCTION AS REQ'D TO MATCH ADJACENT.

DEMOLITION NOTES:

A) PRIOR TO COMMENCEMENT OF ANY DEMOLITION WORK, THE CONTRACTOR SHALL MEET WITH THE OWNER TO DETERMINE WHICH ITEMS, IF ANY, ARE OF SALVAGEABLE VALUE TO THE OWNER. THE CONTRACTOR IS ENCOURAGED TO ALSO DOCUMENT ANY EXISTING DAMAGE OR DEFICIENCIES, IN BOTH WRITTEN AND PHOTOGRAPHIC FORMS AS REQUIRED, WHICH ARE EVIDENT IN THE EXISTING BUILDING.

B) ALL ITEMS DESIGNATED TO BE OF SALVAGEABLE VALUE TO THE OWNER SHALL BE REMOVED AS DIRECTED BY THE OWNER. ALL ITEMS DESIGNATED FOR DEMOLITION SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED COMPLETELY FROM THE SITE AND DISPOSED OF AS NECESSARY, IN ACCORDANCE WITH ALL REGULATIONS IN EFFECT.

C) CONFORM TO APPLICABLE CODES FOR DEMOLITION WORK. SAFETY OF STRUCTURE AND DUST CONTROL. NOTIFY AFFECTED UTILITY COMPANIES BEFORE STARTING WORK AND COMPLY WITH THEIR REQUIREMENTS. DO NOT CLOSE OR OBSTRUCT EGRESS TO EXITS. DO NOT DISRUPT BUILDING, FIRE, OR LIFE SAFETY SYSTEMS WITHOUT (3) DAYS PRIOR WRITTEN NOTICE TO THE OWNER.

D) MAINTAIN TEMPORARY PARTITIONS TO PREVENT THE SPREAD OF DUST, ODORS, AND NOISE. PROTECT EXISTING MATERIALS WHICH ARE NOT TO BE DEMOLISHED.

E) IN AREAS OF DEMOLITION, PATCH, LEVEL, AND INFILL ALL WALL, CEILING AND FLOOR SURFACES AS REQUIRED FOR INSTALLATION OF NEW FINISHES. THIS INCLUDES LEVELING OF ALL FLOORS AND INFILLING OF ANY TRENCHED AREAS.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

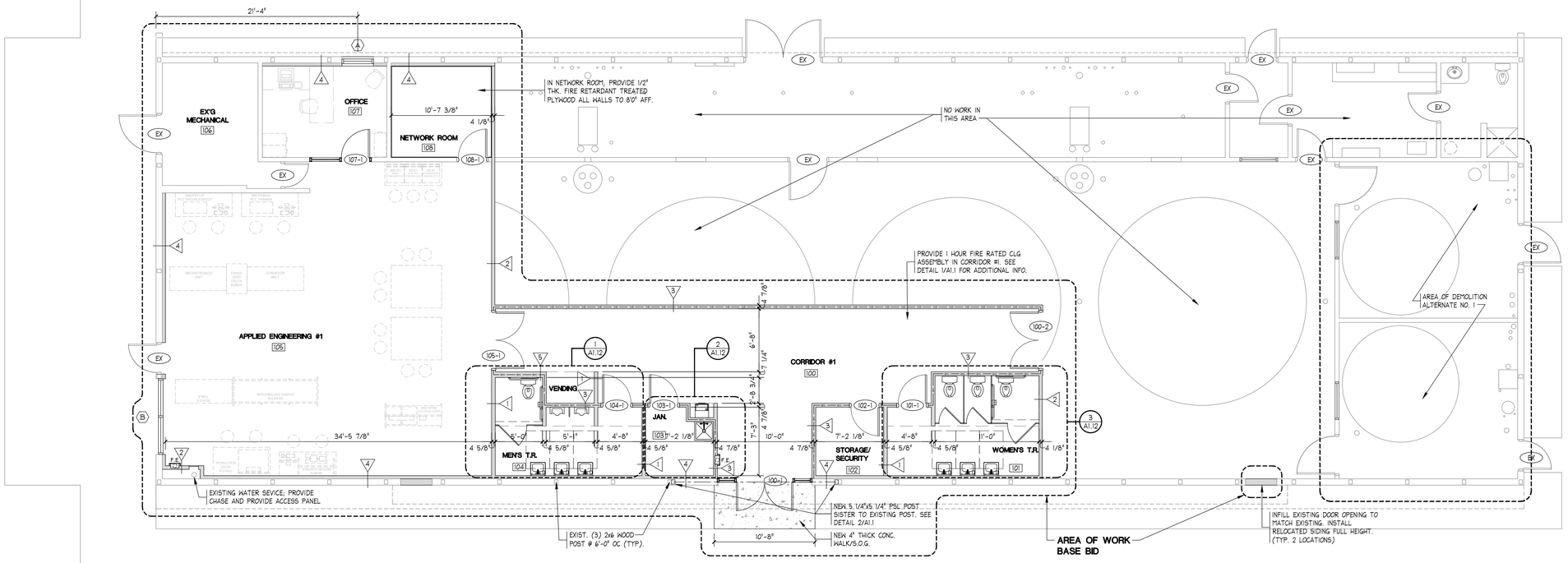
ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

BASE BID DEMOLITION PLAN NOTES

Scale	Job	Sheet
AS NOTED	19002	A1.0
Drawn: MJM	Date: 03/18/19	1 of 12

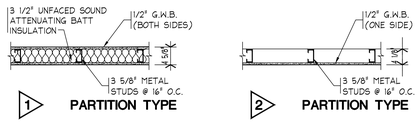


FLOOR PLAN - BASE BID

SCALE: 3/16" = 1'-0" — 1

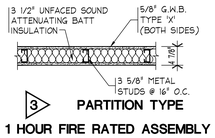
BASE BID

IN AREA OF WORK, PROVIDE ALL LABOR AND MATERIAL REQUIRED TO CONSTRUCT APPLIED ENGINEER #1, CORRIDOR, TOILET ROOMS, JAN. CLOSET AND STORAGE ROOM, INCLUDING BUT NOT LIMITED TO INSTALLATION OF FLOOR LEVELING COMPOUND, PARTITIONS, FLOOR AND WALL FINISHES, CEILINGS, LIGHTING, MECHANICAL, PLUMBING AND ELECTRICAL SYSTEMS AND INTERIOR AND EXTERIOR DOORS AND FRAMES. ALSO INCLUDED IN BASE BID IS EXTERIOR WORK INDICATED ON DRAWING A1.9.



NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.

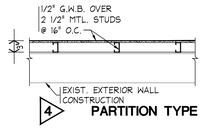
NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.



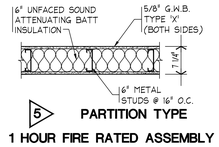
1 HOUR FIRE RATED ASSEMBLY

EXTEND TO UNDERSIDE OF RATED CEILING ASSEMBLY ABOVE IN ACCORDANCE WITH U.L. NO. U465

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.



NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL PARTITIONS TO EXTEND A MINIMUM OF 6" ABOVE SPECIFIED CLG HEIGHT. (TYP. @ EXT. WALL).



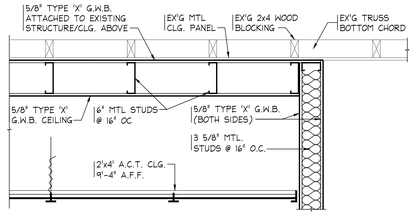
1 HOUR FIRE RATED ASSEMBLY

EXTEND TO UNDERSIDE OF RATED CEILING ASSEMBLY ABOVE IN ACCORDANCE WITH U.L. NO. U465

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.

PARTITION TYPES - BASE BID

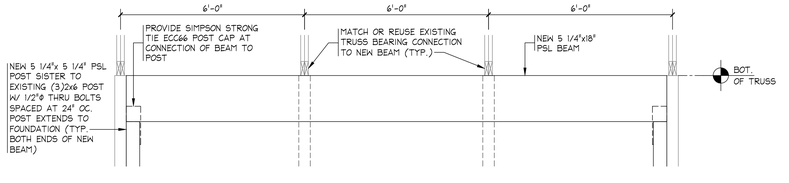
SCALE: 3/4" = 1'-0"



RATED CEILING/CORRIDOR DETAIL — 1

SCALE: 1" = 1'-0"

1 HOUR FIRE RATED WALL/CLG ASSEMBLY IN ACCORDANCE WITH UL DESIGN No. U465. EXTEND TO UNDERSIDE OF EXISTING METAL PANEL CEILING AND MAINTAIN CONTINUITY AS SHOWN. FILL ALL VOIDS AS REQUIRED. (TYP FOR CORRIDOR #1 - BASE BID AND CORRIDOR #2 - ALTERNATE No 2.)



NEW BEAM DETAIL — 2

SCALE: 1/2" = 1'-0"

Revisions

No.	Date	Description

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

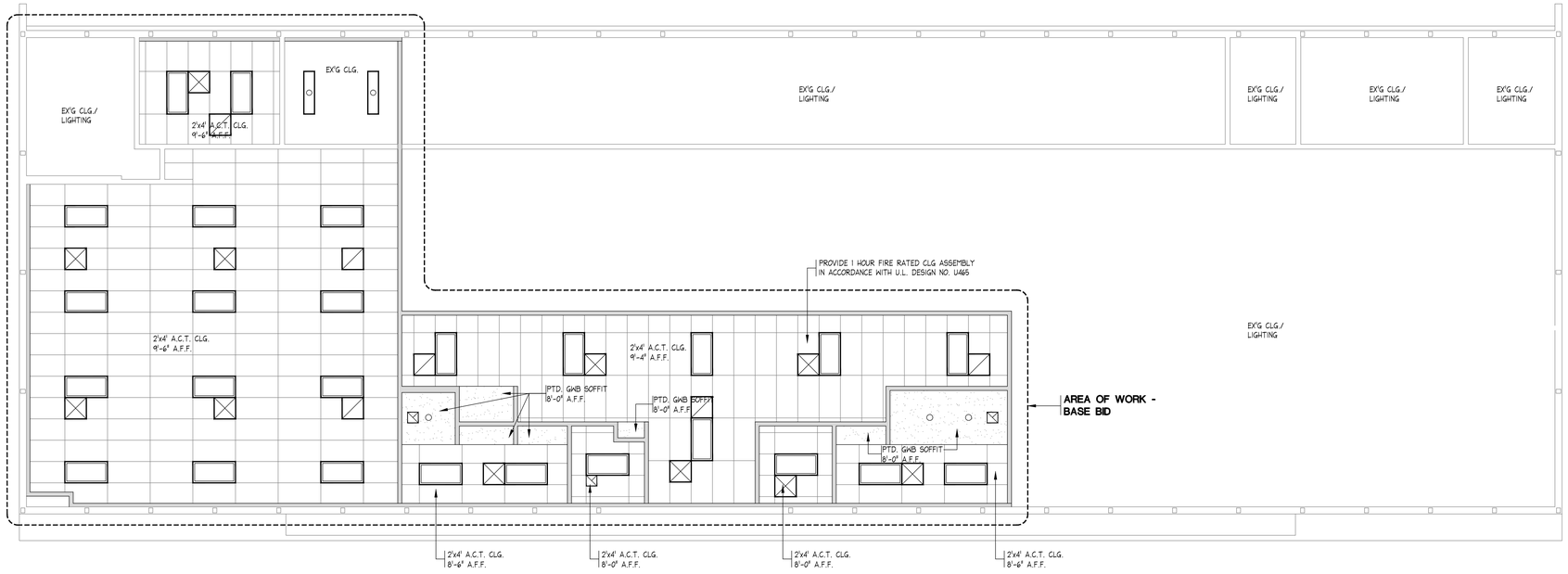
ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

BASE BID FLOOR PLAN, PARTITION TYPES AND DETAILS

Scale	Job	Sheet
AS NOTED	19002	A1.1
Drawn	Date	2 of 12
MJM	03/18/19	



REFLECTED CEILING PLAN - BASE BID

1

SCALE: 3/16" = 1'-0"

NOTES:

1. SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION ON LIGHTING IN AREA OF RENOVATION AND AREAS WHERE EXISTING CEILINGS AND LIGHTING ARE DESIGNATED TO REMAIN.

Revisions

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1138 East Chestnut Avenue I Vineland, New Jersey 08360
p. 856 696 9155 I f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

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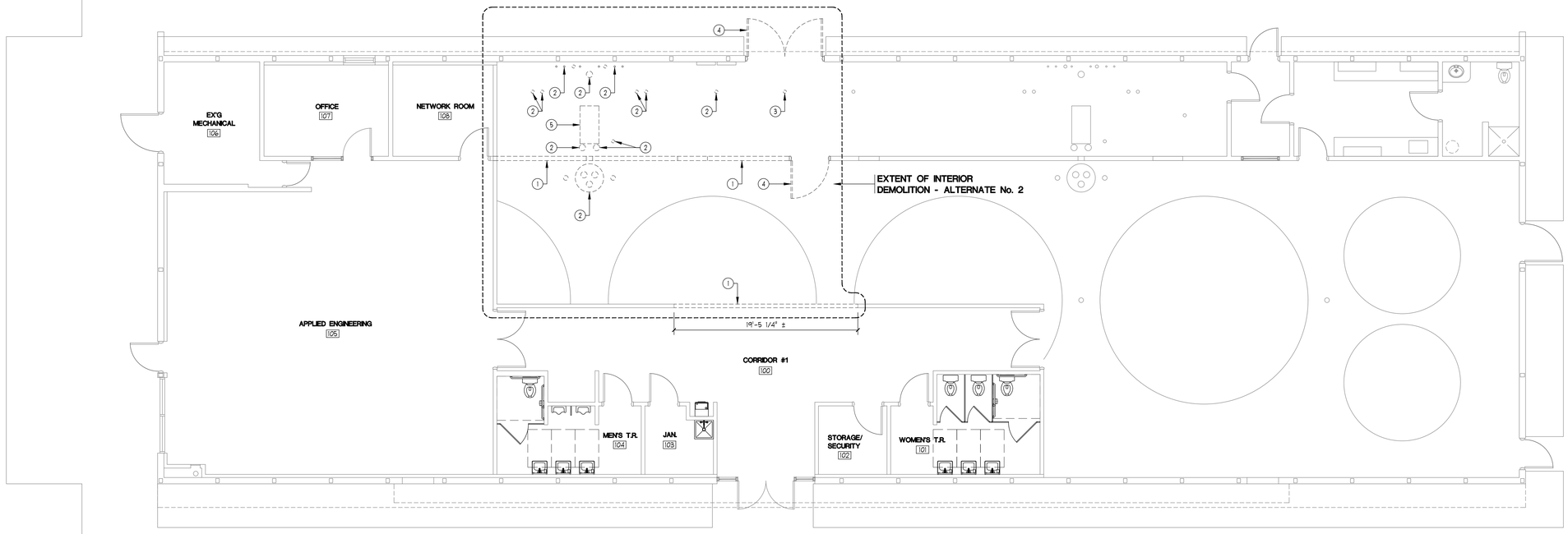
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

BASE BID REFLECTED CEILING PLAN

Scale	Job	Sheet
AS NOTED	19002	A1.2
Drawn	**Date**	3 of 12
MJM	03/18/19	



DEMOLITION PLAN - ALTERNATE No. 2

SCALE: 3/16" = 1'-0"

(1)

ALTERNATE No. 2

IN DESIGNATED AREA, REMOVE EXISTING WALL CONSTRUCTION, INCLUDING DOORS, FRAMES, WINDOWS AND LOUVERS, CONCRETE PADS, PVC PIPING, ETC AS REQUIRED AND AS INDICATED FOR INSTALLATION OF NEW CONSTRUCTION AS SHOWN ON A1.4

KEYNOTES:

(1) REMOVE EXISTING WALL CONSTRUCTION COMPLETE. PATCH EXIST CONSTRUCTION DESIGNATED TO REMAIN AS REQUIRED FOR INSTALLATION OF NEW FINISHES.

(2) REMOVE EXISTING PVC ENCLOSURE/PIPE FLUSH WITH EXISTING CONCRETE SLAB ON GRADE. INFILL PIPE OPENING AS REQUIRED FOR INSTALLATION OF FLOOR LEVELING COMPOUND. SEE PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION. TYPICAL FOR ALL PVC FLOOR PENETRATIONS IN AREA OF WORK NOT DESIGNATED TO REMAIN.

(3) REMOVE EXISTING FLOOR DRAIN; SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION.

(4) REMOVE EXISTING DOOR, FRAME AND ALL ASSOCIATED HARDWARE COMPLETE.

(5) REMOVE EXISTING CONC. PAD; PATCH EXISTING CONSTRUCTION AS REQ'D TO MATCH ADJACENT.

DEMOLITION NOTES:

A) PRIOR TO COMMENCEMENT OF ANY DEMOLITION WORK, THE CONTRACTOR SHALL MEET WITH THE OWNER TO DETERMINE WHICH ITEMS, IF ANY, ARE OF SALVAGEABLE VALUE TO THE OWNER. THE CONTRACTOR IS ENCOURAGED TO ALSO DOCUMENT ANY EXISTING DAMAGE OR DEFICIENCIES, IN BOTH WRITTEN AND PHOTOGRAPHIC FORMS AS REQUIRED, WHICH ARE EVIDENT IN THE EXISTING BUILDING.

B) ALL ITEMS DESIGNATED TO BE OF SALVAGEABLE VALUE TO THE OWNER SHALL BE REMOVED AS DIRECTED BY THE OWNER. ALL ITEMS DESIGNATED FOR DEMOLITION SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED COMPLETELY FROM THE SITE AND DISPOSED OF AS NECESSARY, IN ACCORDANCE WITH ALL REGULATIONS IN EFFECT.

C) CONFORM TO APPLICABLE CODES FOR DEMOLITION WORK, SAFETY OF STRUCTURE AND DUST CONTROL. NOTIFY AFFECTED UTILITY COMPANIES BEFORE STARTING WORK AND COMPLY WITH THEIR REQUIREMENTS. DO NOT CLOSE OR OBSTRUCT EGRESS TO EXITS. DO NOT DISRUPT BUILDING, FIRE, OR LIFE SAFETY SYSTEMS WITHOUT (3) DAYS PRIOR WRITTEN NOTICE TO THE OWNER.

D) MAINTAIN TEMPORARY PARTITIONS TO PREVENT THE SPREAD OF DUST, ODORS, AND NOISE. PROTECT EXISTING MATERIALS WHICH ARE NOT TO BE DEMOLISHED.

E) IN AREAS OF DEMOLITION, PATCH, LEVEL, AND INFILL ALL WALL, CEILING AND FLOOR SURFACES AS REQUIRED FOR INSTALLATION OF NEW FINISHES. THIS INCLUDES LEVELING OF ALL FLOORS AND INFILLING OF ANY TRENCHED AREAS.

Revisions

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mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue I Vineland, New Jersey 08360
p. 856 696 9155 I f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

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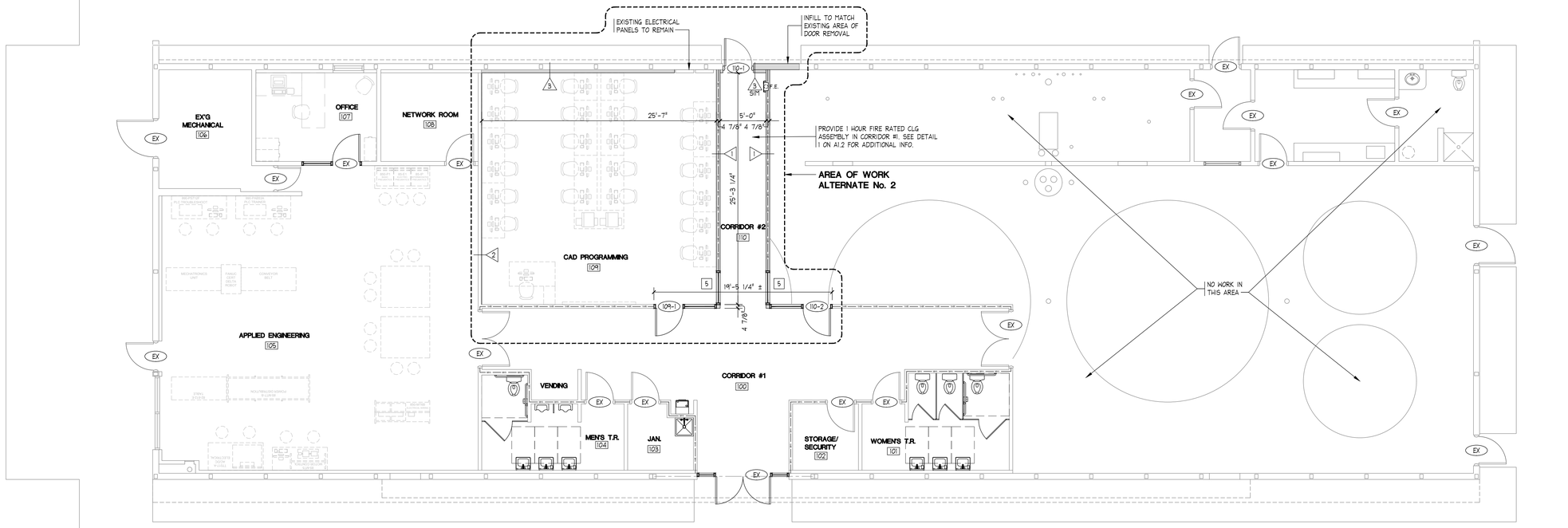
Drawing

ALTERNATE 2 DEMOLITION PLAN NOTES

Scale	Job	Sheet
AS NOTED	19002	A1.3
Drawn	Date	4 of 12
MJM	03/18/19	

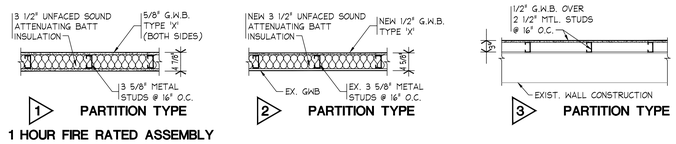


FLOOR PLAN - ALTERNATE No. 2

SCALE: 3/16" = 1'-0" ①

ALTERNATE No. 2

IN AREA OF WORK, PROVIDE ALL LABOR AND MATERIAL REQUIRED TO CONSTRUCT CAD PROGRAMMING CLASSROOM AND CORRIDOR #2, INCLUDING BUT NOT LIMITED TO INSTALLATION OF FLOOR LEVELING COMPOUND, PARTITIONS, FLOOR AND WALL FINISHES, CEILINGS, LIGHTING, MECHANICAL AND ELECTRICAL SYSTEMS AND INTERIOR AND EXTERIOR DOORS AND FRAMES.



1 HOUR FIRE RATED ASSEMBLY

EXTEND TO UNDERSIDE OF RATED CEILING ASSEMBLY ABOVE IN ACCORDANCE WITH U.L. NO. U465

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL PARTITIONS TO EXTEND A MINIMUM OF 6" ABOVE SPECIFIED CLG HEIGHT. (TYP. @ EXT. WALL).

PARTITION TYPES

SCALE: 3/4" = 1'-0"

Revisions

No.	Date	Description

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

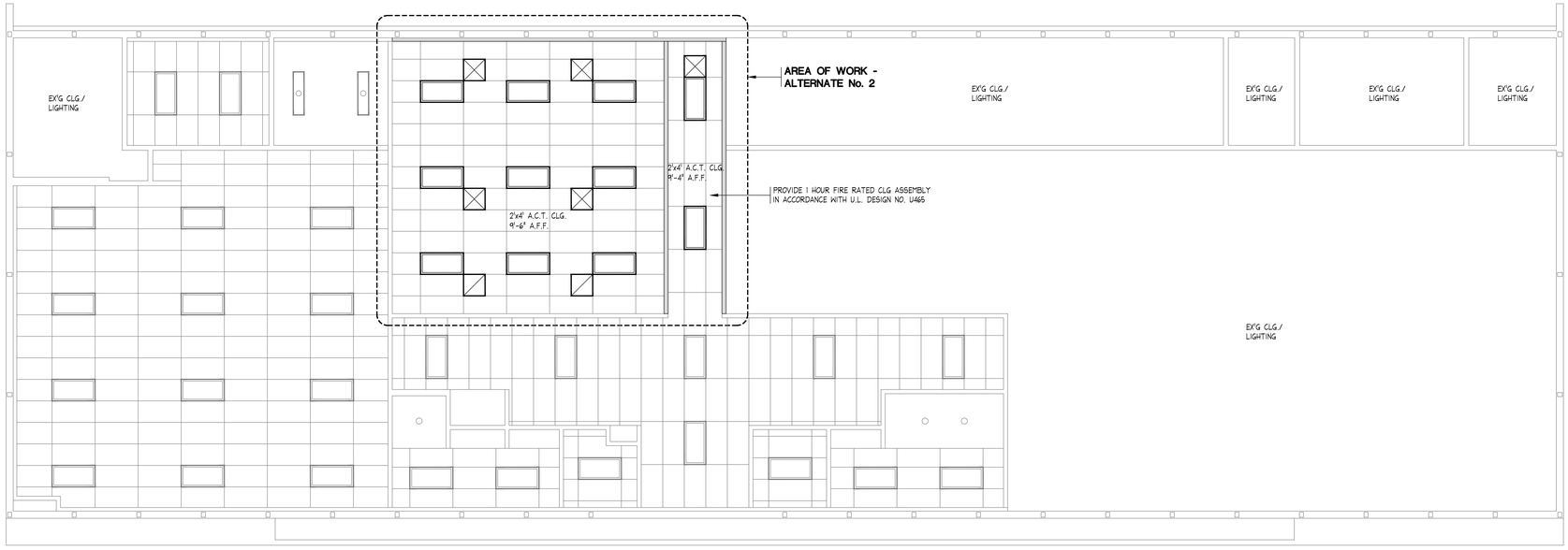
ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ALTERNATE 2 FLOOR PLAN AND PARTITION TYPES

Scale	Job	Sheet
AS NOTED	19002	A1.4
Drawn	Date	5 of 12
MJM	03/18/19	



REFLECTED CEILING PLAN - ALTERNATE No. 2

SCALE: 3/16" = 1'-0"

1

NOTES:

1. SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION ON LIGHTING IN AREA OF RENOVATION AND AREAS WHERE EXISTING CEILINGS AND LIGHTING ARE DESIGNATED TO REMAIN.

Revisions

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mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

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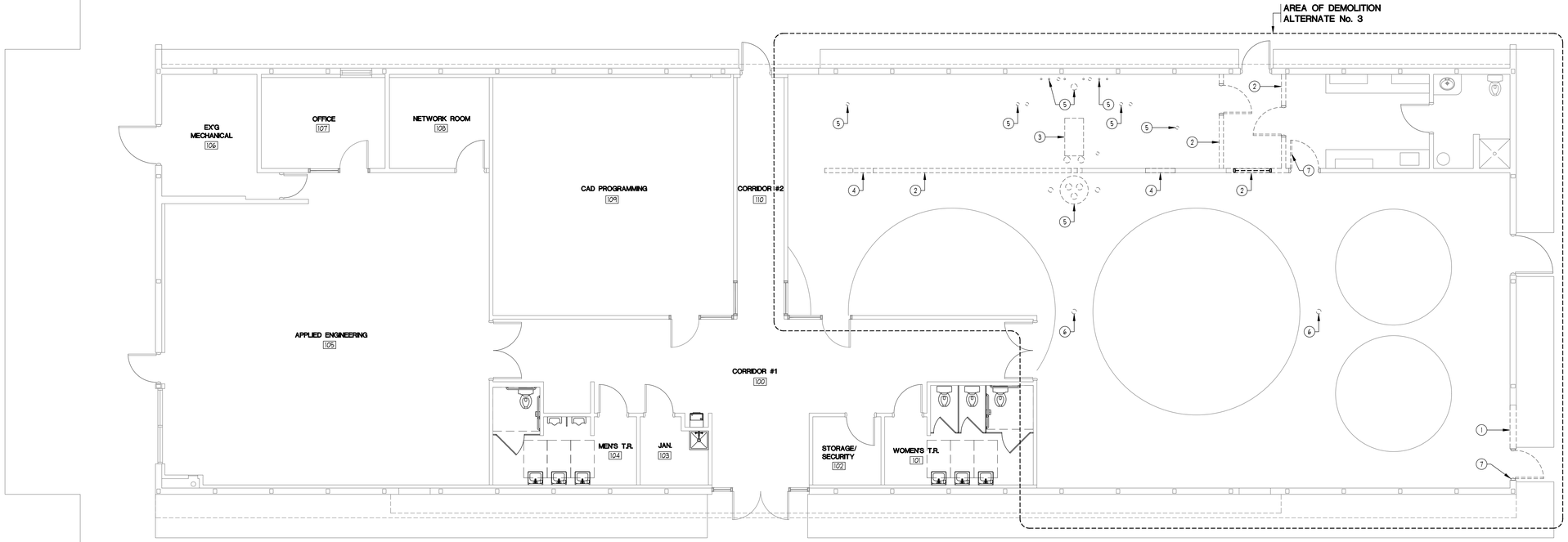
CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ALTERNATE 2
REFLECTED CEILING PLAN

Scale	Job	Sheet
AS NOTED	19002	A1.5
Drawn	Date	6 of 12
MJM	03/18/19	



DEMOLITION PLAN - ALTERNATE No. 3

SCALE: 3/16" = 1'-0"

1

ALTERNATE No. 3

IN DESIGNATED AREA, REMOVE EXISTING WALL CONSTRUCTION, INCLUDING DOORS, FRAMES, WINDOWS AND LOUVERS, CONCRETE PADS, PVC PIPING, ETC AS REQUIRED AND AS INDICATED FOR INSTALLATION OF NEW CONSTRUCTION AS SHOWN ON A1.4

KEYNOTES:

1. REMOVE WALL CONSTRUCTION COMPLETE AND AS REQUIRED FOR INSTALLATION FOR RELOCATED COILING OVERHEAD DOOR.
2. REMOVE EXISTING WALL CONSTRUCTION COMPLETE. PATCH EXIST CONSTRUCTION DESIGNATED TO REMAIN AS REQUIRED FOR INSTALLATION OF NEW FINISHES.
3. REMOVE EXISTING CONC. PAD; PATCH EXISTING CONSTRUCTION AS REQ'D TO MATCH ADJACENT.
4. REMOVE EXISTING LOUVER AND INFILL WALL CONSTRUCTION AS REQUIRED OR PROVIDE NEW DOOR OPENING; SEE FLOOR PLAN.
5. REMOVE PVC PIPE FLUSH W/ EXIST CONC. SLAB ON GRADE; INFILL PIPE OPENING AS REQUIRED FOR INSTALLATION OF FLOOR LEVELING COMPOUND. SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION. TYPICAL FOR ALL PVC FLOOR PENETRATIONS IN AREA OF WORK NOT DESIGNATED TO REMAIN.
6. REMOVE EXISTING FLOOR DRAIN; SEE PLUMBING DWGS. FOR ADDITIONAL INFORMATION.
7. REMOVE EXISTING DOOR, FRAME AND ALL ASSOCIATED HARDWARE COMPLETE.

DEMOLITION NOTES:

A) PRIOR TO COMMENCEMENT OF ANY DEMOLITION WORK, THE CONTRACTOR SHALL MEET WITH THE OWNER TO DETERMINE WHICH ITEMS, IF ANY, ARE OF SALVAGEABLE VALUE TO THE OWNER. THE CONTRACTOR IS ENCOURAGED TO ALSO DOCUMENT ANY EXISTING DAMAGE OR DEFICIENCIES, IN BOTH WRITTEN AND PHOTOGRAPHIC FORMS AS REQUIRED, WHICH ARE EVIDENT IN THE EXISTING BUILDING.

B) ALL ITEMS DESIGNATED TO BE OF SALVAGEABLE VALUE TO THE OWNER SHALL BE REMOVED AS DIRECTED BY THE OWNER. ALL ITEMS DESIGNATED FOR DEMOLITION SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED COMPLETELY FROM THE SITE AND DISPOSED OF AS NECESSARY, IN ACCORDANCE WITH ALL REGULATIONS IN EFFECT.

C) CONFORM TO APPLICABLE CODES FOR DEMOLITION WORK, SAFETY OF STRUCTURE AND DUST CONTROL. NOTIFY AFFECTED UTILITY COMPANIES BEFORE STARTING WORK AND COMPLY WITH THEIR REQUIREMENTS. DO NOT CLOSE OR OBSTRUCT EGRESS TO EXITS. DO NOT DISRUPT BUILDING, FIRE, OR LIFE SAFETY SYSTEMS WITHOUT (3) DAYS PRIOR WRITTEN NOTICE TO THE OWNER.

D) MAINTAIN TEMPORARY PARTITIONS TO PREVENT THE SPREAD OF DUST, ODORS, AND NOISE. PROTECT EXISTING MATERIALS WHICH ARE NOT TO BE DEMOLISHED.

E) IN AREAS OF DEMOLITION, PATCH, LEVEL, AND INFILL ALL WALL, CEILING AND FLOOR SURFACES AS REQUIRED FOR INSTALLATION OF NEW FINISHES. THIS INCLUDES LEVELING OF ALL FLOORS AND INFILLING OF ANY TRENCHED AREAS.

Revisions

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mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

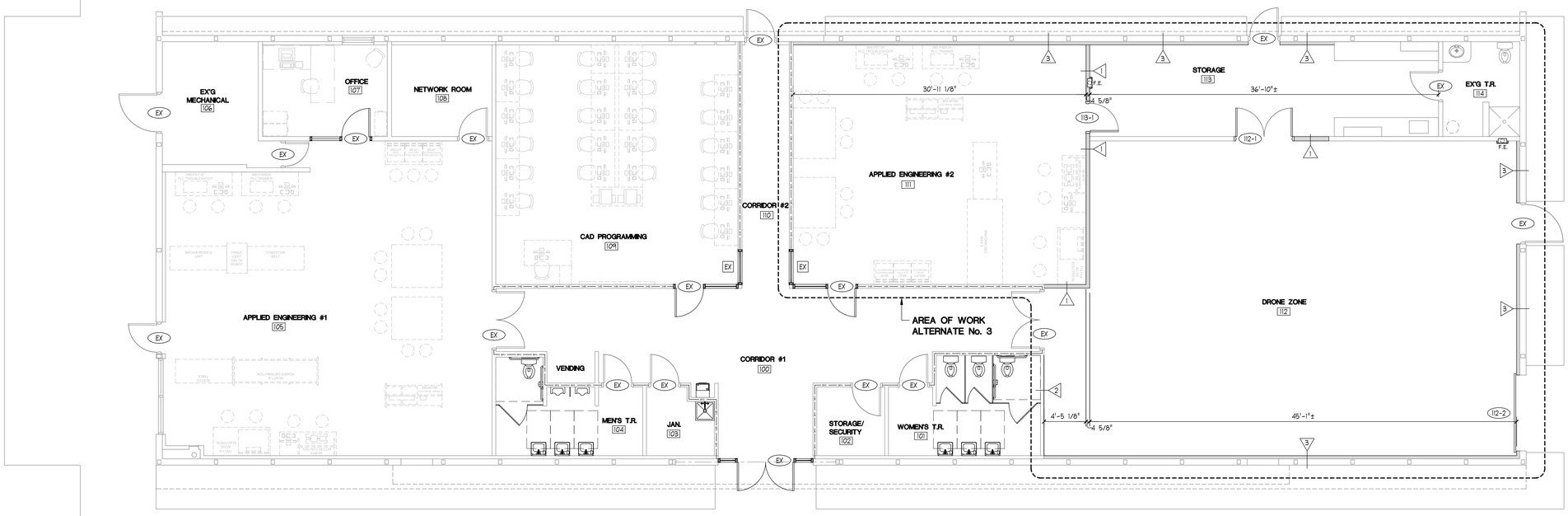
ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ALTERNATE 3 DEMOLITION PLAN NOTES

Scale	Job	Sheet
AS NOTED	19002	A1.6
Drawn	**Date**	7 of 12
MJM	03/18/19	



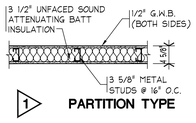
FLOOR PLAN - ALTERNATE No. 3

SCALE: 3/16" = 1'-0"

1

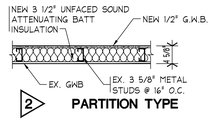
ALTERNATE No. 3

IN AREA OF WORK, PROVIDE ALL LABOR AND MATERIAL REQUIRED TO CONSTRUCT APPLIED ENGINEERING #2, DRONE ZONE AND STORAGE, INCLUDING BUT NOT LIMITED TO INSTALLATION OF FLOOR LEVELING COMPOUND, PARTITIONS, FLOOR AND WALL FINISHES, CEILINGS, LIGHTING, MECHANICAL AND ELECTRICAL SYSTEMS AND INTERIOR AND EXTERIOR DOORS AND FRAMES. THE INSTALLATION OF THE RELOCATED OVERHEAD COILING DOOR (SEE BASE BID DWGS.) IS ALSO INCLUDED.



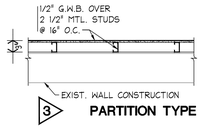
1 **PARTITION TYPE**

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.



2 **PARTITION TYPE**

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.



3 **PARTITION TYPE**

NOTES:
1. USE MOISTURE RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS AND JANITORS CLOSET.
2. ALL ROOM PARTITIONS TO EXTEND TO UNDERSIDE OF EXIST. METAL CEILING PANEL ABOVE. EXTEND GWB TO EXIST. CEILING ON SIDE OF PARTITION.

PARTITION TYPES

SCALE: 3/4" = 1'-0"

Revisions

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Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue I Vineland, New Jersey 08360
p. 856 696 9155 I f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

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RENOVATIONS TO:

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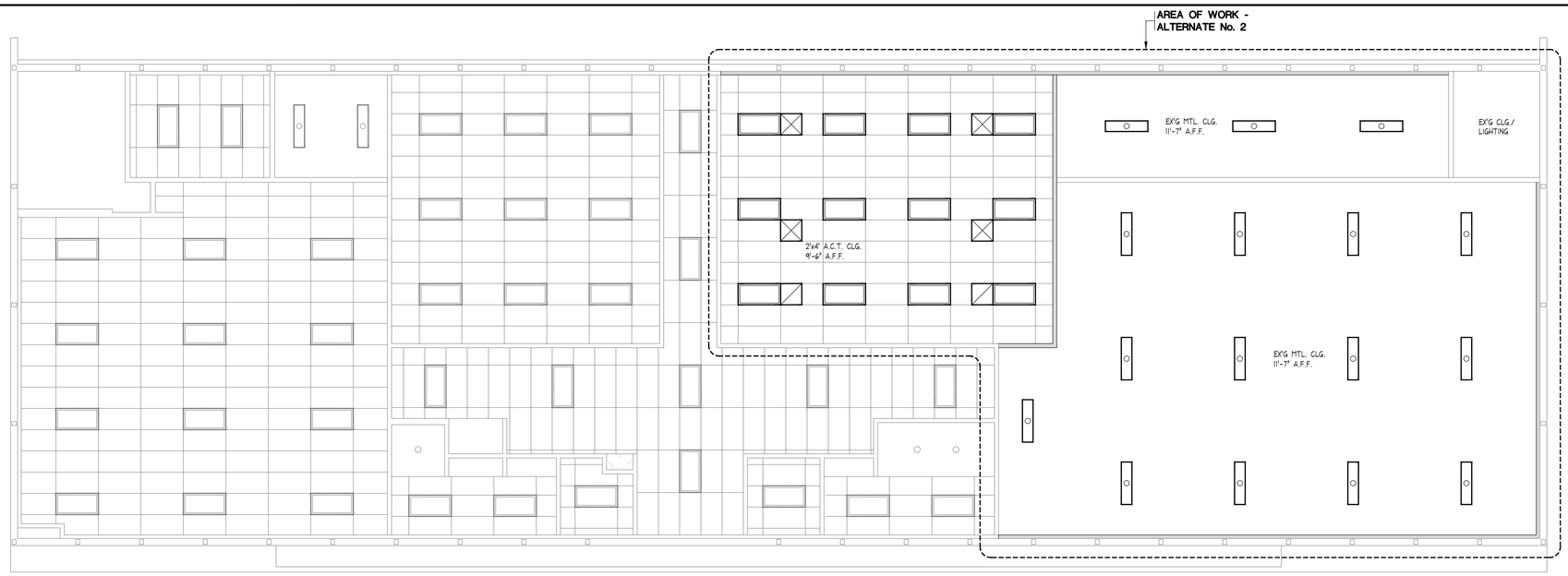
Drawing

ALTERNATE 3 FLOOR PLAN AND PARTITION TYPES

Scale	Job	Sheet
AS NOTED	19002	A1.7
Drawn	Date	8 of 12
MJM	03/18/19	



REFLECTED CEILING PLAN - ALTERNATE 3 — 1

SCALE: 3/16" = 1'-0"

NOTES:

1. SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION ON LIGHTING IN AREA OF RENOVATION AND AREAS WHERE EXISTING CEILINGS AND LIGHTING ARE DESIGNATED TO REMAIN.

Revisions

No.	Date	Description

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Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
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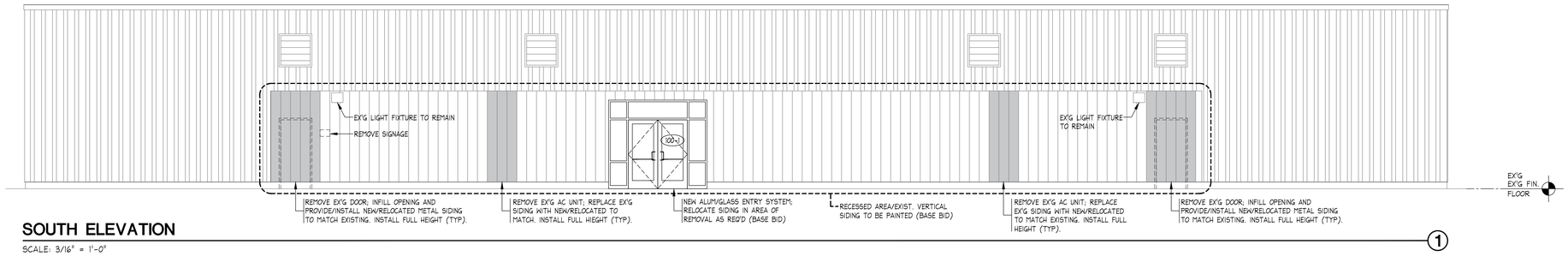
Drawing

ALTERNATE 3 REFLECTED CEILING PLAN

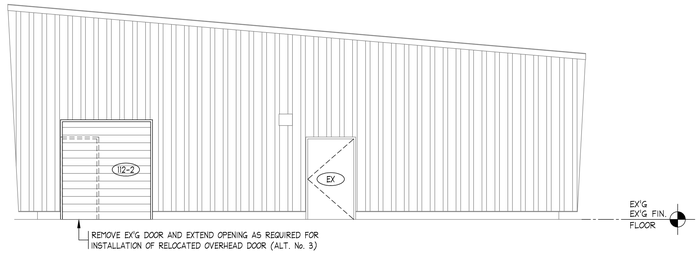
Scale	Job	Sheet
AS NOTED	19002	A1.8
Drawn	Date	9 of 12
MJM	03/18/19	



SOUTH ELEVATION

SCALE: 3/16" = 1'-0"

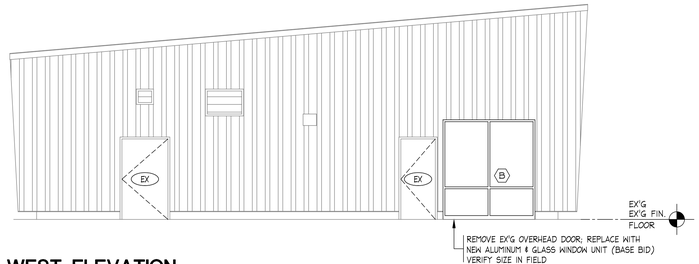
1



EAST ELEVATION

SCALE: 3/16" = 1'-0"

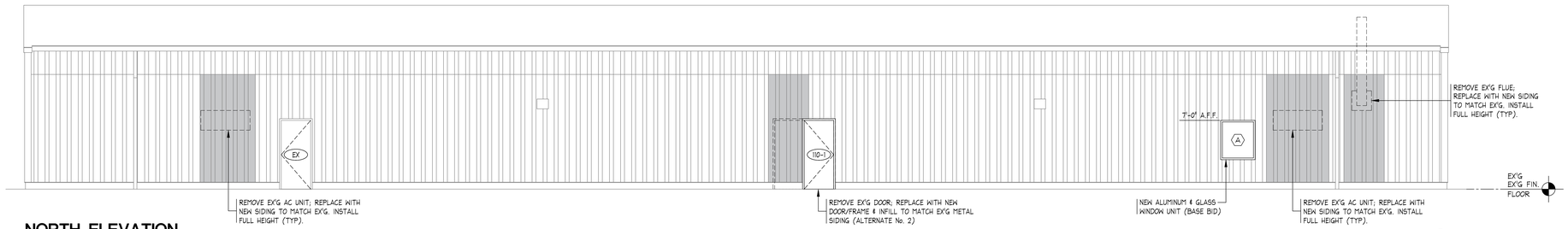
2



WEST ELEVATION

SCALE: 3/16" = 1'-0"

3



NORTH ELEVATION

SCALE: 3/16" = 1'-0"

4

NOTES:

1. ALL WORK SHOWN ON EXTERIOR ELEVATIONS IS TO BE A PART OF THE BASE BID WITH THE EXCEPTION OF THE FOLLOWING:

   A. INSTALLATION OF THE NEW EXTERIOR MAN DOOR No. 110-1, INCLUDING THE REMOVAL OF THE EXISTING DOUBLE DOOR AND THE REPLACEMENT OF METAL SIDING IN THIS AREA - ALTERNATE No. 2

   B. INSTALLATION OF OVERHEAD COILING DOOR # 112-2 INCLUDING THE REMOVAL OF AN EXISTING MAN DOOR AND ANY ASSOCIATED DEMOLITION AND CONSTRUCTION REQUIRED - ALTERNATE No. 3

Revisions

No.	Date	Description

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA	AI-07220
Lawrence J. Merighi AIA	AI-07473
Ronald P. Portadin AIA	AI-13038
Peter W. Farrell AIA	AI-13618

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RENOVATIONS TO:

ENGINEERING LAB

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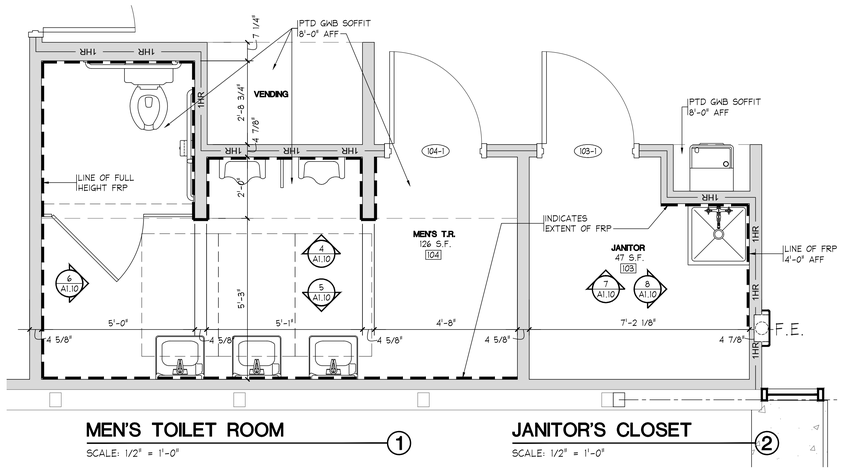
Drawing ELEVATIONS		
Scale AS NOTED	**Job** 19002	**Sheet** A1.9
Drawn MJM	**Date** 03/18/19	10 of 12

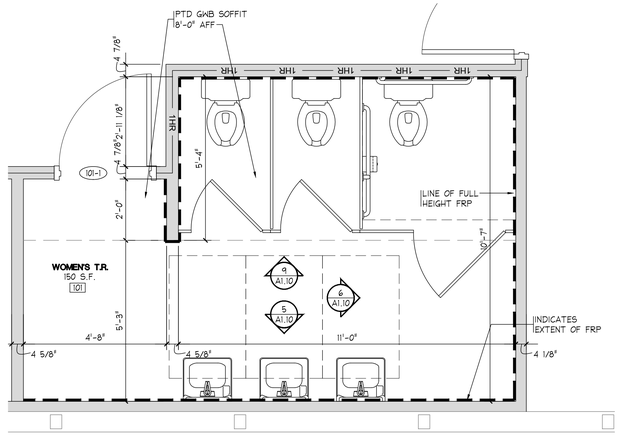


MEN'S TOILET ROOM ①

SCALE: 1/2" = 1'-0"

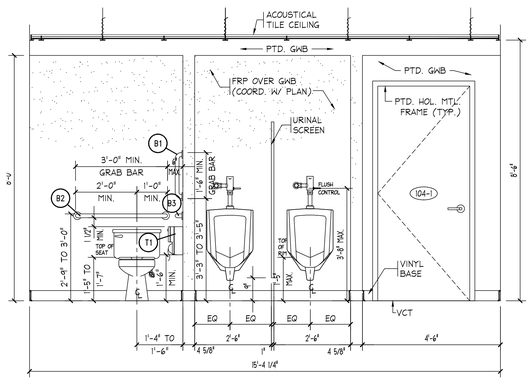
JANITOR'S CLOSET ②

SCALE: 1/2" = 1'-0"



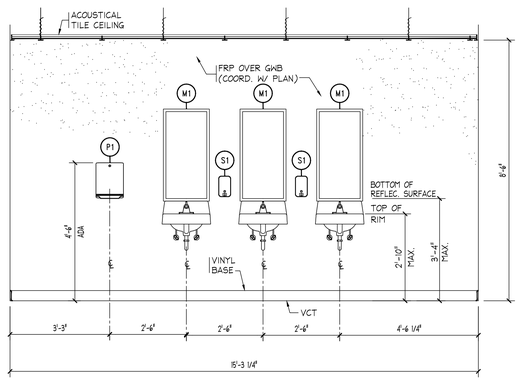
WOMEN'S TOILET ROOM ③

SCALE: 1/2" = 1'-0"



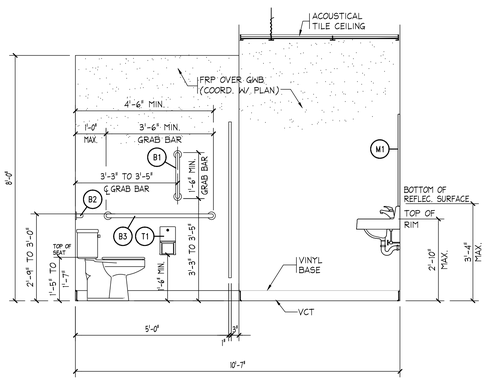
MEN'S TOILET ROOM ④

SCALE: 1/2" = 1'-0"



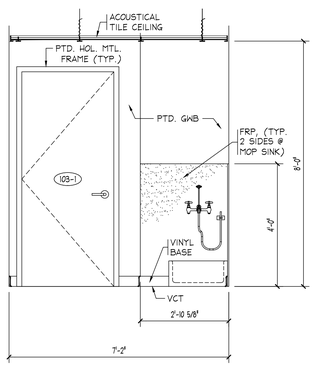
MEN'S TOILET ROOM ⑤

SCALE: 1/2" = 1'-0"
WOMEN'S TOILET ROOM OPP. HAND



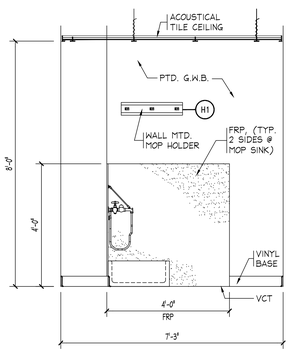
MEN'S TOILET ROOM ⑥

SCALE: 1/2" = 1'-0"
WOMEN'S TOILET ROOM OPP. HAND



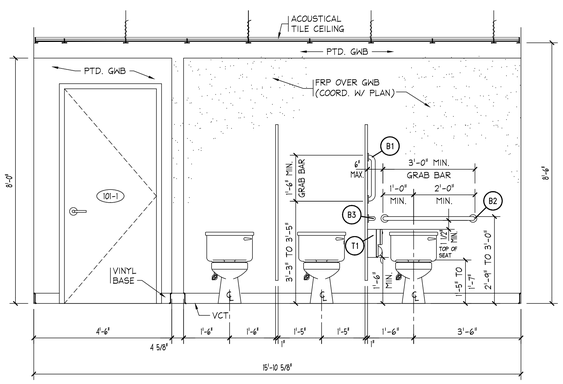
JANITOR'S CLOSET ⑦

SCALE: 1/2" = 1'-0"



JANITOR'S CLOSET ⑧

SCALE: 1/2" = 1'-0"



WOMEN'S TOILET ROOM ⑨

SCALE: 1/2" = 1'-0"

TOILET ROOM ACCESSORY SCHEDULE

ROOM NAME	(B-1) GRAB BARS B-6806.99 18"	(B-2) GRAB BARS B-6806.99 36"	(B-3) GRAB BARS B-6806.99 42"	(T-1) TOILET TISSUE DISPENSER B-3474	(P-2) PAPER TOWEL DISP. U180	(S-1) SOAP DISPENSER B-2112	(M-1) MIRROR B-290 1836	(H-1) MOP HOOK B-290 1836
WOMEN'S T.R.	(1)	(1)	(1)	(3)	(1)	(2)	(3)	-
MEN'S T.R.	(1)	(1)	(1)	(1)	(1)	(2)	(3)	-
JANITOR'S CLOSET	-	-	-	-	-	-	-	(1)

NOTES 1. LISTED 'B' MODEL NO.S ARE BY 'BOBRICK' - STAINLESS STL. W/ SATIN FINISH

Revisions

No.	Date	Description

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA	AI-07220
Lawrence J. Merighi AIA	AI-07473
Ronald P. Portadin AIA	AI-13038
Peter W. Farrell AIA	AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ENLARGED TOILET ROOM PLANS AND INTERIOR ELEVATIONS

Scale	Job	Sheet
AS NOTED	19002	A1.10
Drawn	**Date**	11 of 12
MJM	03/18/19	

ROOM FINISH SCHEDULE

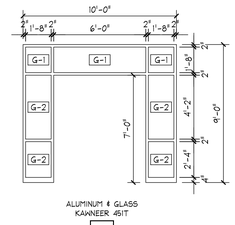
	ROOM NO.	ROOM NAME	FLOOR	BASE	WALL	CLG.	HEIGHT	REMARKS
BASE BID	100	CORRIDOR #1	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-4"	1 HR FIRE RATED CLG.
	101	WOMEN'S T.R.	L.V.T.	VINYL	FRP / G.W.B.	A.C.T. / GWB	8'-6" / 8'-0"	
	102	STORAGE/SECURITY	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	8'-0"	
	103	JANITOR	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	8'-0"	
	104	MEN'S T.R.	L.V.T.	VINYL	FRP / G.W.B.	A.C.T. / GWB	8'-6" / 8'-0"	
	105	APPLIED ENGINEERING #1	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-6"	
	106	EX'G MECHANICAL	EX'G	EX'G	EX'G	EX'G	11'-7" ±	EXIST. METAL CLG.
	107	OFFICE	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-6"	
	108	NETWORK ROOM	L.V.T.	VINYL	PTD. G.W.B./PLYW'D	EX'G	11'-7" ±	EXIST. METAL CLG. / SEE NOTE 2
ALT2	109	CAD PROGRAMMING	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-6"	
	110	CORRIDOR #2	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-4"	1 HR FIRE RATED CLG.
ALT3	111	APPLIED ENGINEERING #2	L.V.T.	VINYL	PTD. G.W.B.	ACOUST. TILE	9'-6"	
	112	DRONE ZONE	L.V.T.	VINYL	PTD. G.W.B.	EX'G	11'-7" ±	EXIST. METAL CLG.
	113	STORAGE	L.V.T.	VINYL	PTD. G.W.B.	EX'G	11'-7" ±	EXIST. METAL CLG.
	114	EX'G TOILET ROOM	EX'G	EX'G	EX'G	EX'G	11'-7" ±	EXIST. METAL CLG.

NOTES:
1. COORDINATE ALL FINISH SELECTIONS/LOCATIONS WITH OWNER.
2. IN NETWORK ROOM, PROVIDE 1/2" THICK FIRE RETARDANT THREATED PLYWOOD ALL WALLS TO 8'-0" AFF IN NETWORK ROOM.

DOOR SCHEDULE

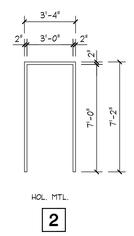
	NO.	DOOR						FRAME			HDW. NO.	FIRE RATING	REMARKS	NO.
		WIDTH	HEIGHT	THK.	TYPE	MATERIAL	FINISH	TYPE	MATERIAL	FINISH				
BASE BID	100-1	6'-0"	7'-0"	2"	AGP	ALUM/GLASS	MFR.	1	ALUMINUM	MFR.	1			100-1
	100-2	6'-0"	7'-0"	1 3/4"	HLP	S.C. WOOD	PTD.	3	HOL. METAL	PTD.	2	20 MIN.		100-2
	101-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	3	20 MIN.		101-1
	102-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	4	20 MIN.		102-1
	103-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	4	20 MIN.		103-1
	104-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	3	20 MIN.		104-1
	105-1	6'-0"	7'-0"	1 3/4"	HLP	S.C. WOOD	PTD.	3	HOL. METAL	PTD.	2	20 MIN.		105-1
	107-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	4	HOL. METAL	PTD.	5			107-1
	108-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	6			108-1
	109-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	4	HOL. METAL	PTD.	7	20 MIN.		109-1
ALT2	110-1	3'-0"	7'-0"	2"	F	HOL. METAL	PTD.	2	HOL. METAL	PTD.	8			110-1
	110-2	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	4	HOL. METAL	PTD.	7	20 MIN.		110-2
ALT3	112-1	6'-0"	7'-0"	1 3/4"	FP	S.C. WOOD	PTD.	3	HOL. METAL	PTD.	2			112-1
	112-2	8'-4"	8'-0"	———	OH		———	———	———	———	9		RELOCATED OVERHEAD COILING DOOR	112-2
	113-1	3'-0"	7'-0"	1 3/4"	F	S.C. WOOD	PTD.	2	HOL. METAL	PTD.	6			113-1

NOTES:
1. ALL DOOR HARDWARE TO CONFORM TO NJ UCC BARRIER-FREE SUBCODE
2. SEE SPECIFICATIONS FOR ALL H.M. FRAMES IN CONTACT W/ MASONRY.
3. COORDINATE ALL HARDWARE AND KEYING W/ OWNER.
4. CONTRACTOR TO VERIFY SIZE OF RELOCATED OVERHEAD COILING DOOR.



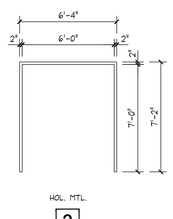
ALUMINUM & GLASS
KAWNEER 451T

1



HOL. MTL.

2



HOL. MTL.

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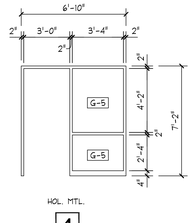
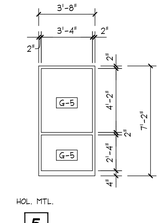


HOL. MTL.

4



HOL. MTL.

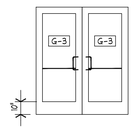
5

ALUMINUM FRAME TYPES

SCALE: 1/4" = 1'-0"

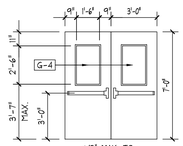
HOLLOW METAL FRAME TYPES

SCALE: 1/4" = 1'-0"



KAWNEER 350 MEDIUM STILE

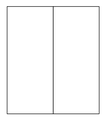
AGP



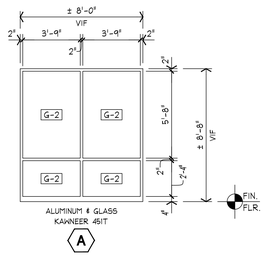
48" MAX. TO
VISIBLE GLASS
PER ADA.

HLP

F

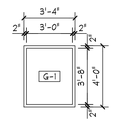


FP



ALUMINUM & GLASS
KAWNEER 451T

A



ALUM. & GLASS
KAWNEER 451T

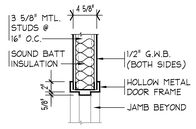
B

DOOR TYPES

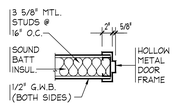
SCALE: 1/4" = 1'-0"

WINDOW TYPES

SCALE: 1/4" = 1'-0"



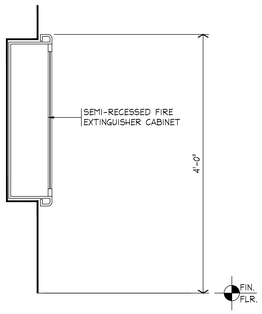
DH-1



DJ-1

DOOR:
TYPICAL HEAD & JAMB DETAILS

SCALE: 1" = 1'-0"



F.E.C. DETAIL - SEMI RECESSED (1)

SCALE: 1 1/2" = 1'-0"

NOTE: SEMI-RECESSED FIRE EXTINGUISHER CABINET SHOWN. PROVIDE SURFACE & RECESSED MODELS AS NOTED ON PLAN. PROVIDE SOLID WOOD BLOCKING AS REQUIRED.

Revisions

No.	Date	Description

GLAZING SCHEDULE

TYPE	DESCRIPTION
G-1	1" INSULATED GLASS
G-2	1" INSULATED TEMPERED SAFETY GLASS
G-3	1/4" TEMPERED SAFETY GLASS
G-4	20 MINUTE FIRE RATED GLASS
G-5	45 MINUTE FIRE RATED GLASS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
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Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing
DOOR, FRAME & WINDOW TYPES, SCHEDULES AND DETAILS

Scale	Job	Sheet
AS NOTED	19002	A1.11
Drawn: MJM	Date: 03/18/19	12 of 12

ELECTRICAL LEGEND

LIGHTING

SYMBOL	DESCRIPTION
○	CEILING OUTLET AND LIGHTING FIXTURE AS SCHEDULED.
○	WALL OUTLET AND LIGHTING FIXTURE AS SCHEDULED.
▭	CEILING OUTLET AND LIGHTING FIXTURE AS SCHEDULED.
▭	CEILING OUTLET AND LIGHTING FIXTURE WITH INTEGRAL 90 MINUTE BACKUP BATTERY PACK AS SCHEDULED.
▭	CEILING OUTLET AND LIGHTING FIXTURE AS SCHEDULED.
▭	CEILING OUTLET AND LIGHTING FIXTURE WITH INTEGRAL 90 MINUTE BACKUP BATTERY PACK AS SCHEDULED.
⊗ ⊗	CEILING OUTLET AND EXIT LIGHTING FIXTURE AS SCHEDULED.
⊗ ⊗	WALL OUTLET AND EXIT LIGHTING FIXTURE AS SCHEDULED.
⬡	LIGHTING FIXTURE TYPE.
S	SINGLE POLE 20A SWITCH. MOUNT 44" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
S^{MS}	WALL OUTLET AND PASSIVE INFRARED OCCUPANCY SENSOR FOR LIGHTING CONTROL, MANUAL "ON" AND AUTOMATIC "OFF". MOUNT 44" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
S^{OR}	WALL OUTLET AND LOW VOLTAGE SWITCH FOR UNOCCUPIED OVERRIDE OPERATION. MOUNT 44" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
"a,b,c"	LOWER CASE LETTERS AT OUTLETS INDICATE SWITCHING ARRANGEMENT.
(MS)	CEILING OUTLET AND DUAL TECHNOLOGY. (ULTRASONIC OR MICROPHONICS) OCCUPANCY SENSOR. FOR LIGHTING CONTROL.
(PP)	LIGHTING CONTROL POWER PACK RELAY ASSEMBLY WITH AUXILIARY CONTACT FOR INTERCONNECTION TO TEMPERATURE CONTROL SYSTEM, 20AMP, 120/277V.

TELECOMMUNICATIONS

SYMBOL	DESCRIPTION
◀	WALL OUTLET AND BLANK DEVICE PLATE FOR TELECOM JACKS, NUMBER INDICATED ON DRAWING. PROVIDE 1" MINIMUM CONDUIT WITH PULL-STRING FROM BOX TO ACCESSIBLE CEILING CAVITY AND BUSH END. COORDINATE CONDUIT SIZE WITH TELECOM CABLE PROVIDER. BOX SHALL BE 4"x4" MINIMUM WITH SINGLE GANG OPENING. PROVIDE CABLING FROM EACH JACK BACK TO DATA CLOSET AND TERMINATE.
AP ▽	WIRELESS ACCESS POINT. PROVIDE OUTLET BOX AND 1" MINIMUM CONDUIT WITH PULL-STRING FROM BOX TO ACCESSIBLE CEILING CAVITY AND BUSH END. COORDINATE REQUIREMENTS WITH OWNER BEFORE ROUGH-IN. ACCESS POINT PROVIDED BY OWNER. PROVIDE CABLING BACK TO DATA CLOSET AND TERMINATE.

RACEWAY

SYMBOL	DESCRIPTION
	EXPOSED CONDUIT.
	CONDUIT CONCEALED UNDER FLOOR.
	POINT OF CONNECTION TO EXISTING.
PHASE CONDUCTORS NEUTRAL GROUND	CIRCUIT CONCEALED IN CEILING OR WALL. CROSSBARS INDICATE NUMBER OF CONDUCTORS REQUIRED. CONDUIT NOT SIZED IS 3/4" CONDUCTORS NOT SIZED ARE NO. 12.
A-1,3,5	HOMERUN TO PANELBOARD INDICATED. NUMBER OF ARROWHEADS INDICATES NUMBER OF CIRCUITS. NUMBER INDICATES CIRCUIT NUMBERS. PREFIX INDICATES PANEL NUMBER.

POWER

SYMBOL	DESCRIPTION
	WALL OUTLET WITH 20A, 125V DUPLEX RECEPTACLE. MOUNT 16" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
	WALL OUTLET WITH 20A, 125V DOUBLE DUPLEX (QUADRAPLEX) RECEPTACLE. MOUNT 16" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
	SPECIAL OUTLET AS NOTED. MOUNT 16" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
(J)	CEILING MOUNTED JUNCTION BOX.
(J)	WALL MOUNTED JUNCTION BOX, MOUNT 16" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE. S = SURFACE MOUNTED. BP = BLANK PLATE.
✦	ROUGH-IN AND FINAL CONNECTION.
F	FUSIBLE DISCONNECT SWITCH. MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.
N	NON-FUSIBLE DISCONNECT SWITCH. MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.
M	COMBINATION MAGNETIC MOTOR CONTROLLER TO SUIT MOTOR. MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.
M_P	MANUAL MOTOR CONTROLLER TO SUIT MOTOR. MOUNT 44" A.F.F. TO TOP, UNLESS NOTED OTHERWISE. P = PILOT LIGHT.
M	MAGNETIC MOTOR CONTROLLER TO SUIT MOTOR. MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.
	MOTOR.
	WORKING CLEARANCE — SURFACE MOUNTED 208Y/120V PANELBOARD.
	WORKING CLEARANCE — RECESSED MOUNTED 208Y/120V PANELBOARD.
	WORKING CLEARANCE — SURFACE MOUNTED 480Y/277V PANELBOARD.

GENERAL DEVICE SUBSCRIPTS

SYMBOL	DESCRIPTION
"1,2,3"	NUMBER AT OUTLET INDICATES CIRCUIT ARRANGEMENT.
"NL"	INDICATES NIGHT LIGHT CIRCUIT OR UNSWITCHED WHEN SHOWN ON LIGHTING PLANS ADJACENT TO FIXTURE.
"N.I.C."	INDICATES "NOT IN CONTRACT" WHEN SHOWN ADJACENT TO SYMBOL.
"GFI"	INDICATES GROUND FAULT CURRENT INTERRUPTER WHEN SHOWN ADJACENT TO SYMBOLS ON POWER PLANS.
"WP"	INDICATES WEATHER PROOF WHEN SHOWN ADJACENT TO SYMBOLS ON LIGHTING, POWER, OR SYSTEMS PLANS. PROVIDE APPROPRIATE ENCLOSURES AND/OR COVERS.
"AC"	INDICATED MOUNT DEVICE VERTICALLY 6" ABOVE COUNTER/ COUNTER BACKSPLASH TO BOTTOM WHEN SHOWN ADJACENT TO SYMBOL.
"EX"	INDICATES DEVICE IS EXISTING WHEN SHOWN ADJACENT TO DEVICE SYMBOL ON PLANS.

FIRE ALARM SYSTEM

SYMBOL	DESCRIPTION
	FIRE ALARM SYSTEM VISUAL ONLY DEVICE. WALL MOUNT AT 80 INCHES A.F.F. TO BOTTOM, OR 6 INCHES BELOW CEILING TO TOP, WHICHEVER IS LOWER.
SF	CEILING MOUNT SMOKE DETECTOR. FIRE ALARM SYSTEM.
F	FIRE ALARM SYSTEM MANUAL PULL STATION. MOUNT AT 44 INCHES A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.
HF	CEILING MOUNT HEAT DETECTOR. FIRE ALARM SYSTEM.
M	FIRE ALARM SYSTEM ADDRESSIBLE MONITOR MODULE.
C	FIRE ALARM SYSTEM ADDRESSIBLE CONTROL RELAY MODULE.
	FIRE ALARM SYSTEM AUDIO AND VISUAL DEVICE. WALL MOUNT AT 80 INCHES A.F.F. TO BOTTOM, OR 6 INCHES BELOW CEILING TO TOP, WHICHEVER IS LOWER.
SD S	SMOKE DETECTOR WITH DUCT PROBE. AIR HANDLING UNIT SHALL SHUT DOWN UPON ACTIVATION OF DUCT SMOKE DETECTOR. SUBSCRIPT: S = MOUNTED IN SUPPLY AIR DUCT. R = MOUNTED IN RETURN AIR DUCT.
FACP	FIRE ALARM CONTROL PANEL

NOTES: ALL DEVICES SHALL BE RATED WITH ENCLOSURES APPROPRIATE FOR DEVICE LOCATIONS. ALL INSTALLATIONS SHALL MEET NFPA AND LOCAL AUTHORITY CODES AND STANDARDS. INSTALL PER APPROVED SELECTED VENDOR SHOP DRAWINGS.

ONE LINE AND WIRING DIAGRAM

SYMBOL	DESCRIPTION
	TRANSFORMER.
	CIRCUIT BREAKER.
	MAINTAINED CONTACT ON-OFF SWITCH.
	NORMALLY CLOSED PUSHBUTTON.
	MUSHROOM HEAD OPERATOR PUSHBUTTON.
	NORMALLY OPEN PUSHBUTTON.
	NORMALLY OPEN (N.O.) PUSHBUTTON SWITCH.
	NORMALLY CLOSED (N.C.) PUSHBUTTON SWITCH.
	NORMALLY OPEN CONTACT.
	POINT OF CONNECTION TO GROUND POTENTIAL.
	NORMALLY CLOSED CONTACT.
	INDICATING LIGHT. R = RED, G = GREEN, B = BLUE, A = AMBER.
	OVERLOAD ELEMENT.
	SWITCH AND FUSE UNIT.
	FUSE.
	FUSE.
	SOLIDLY GROUNDED WYE CONNECTION.
△	DELTA CONNECTION.

LIGHTING FIXTURE SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	LAMP TYPE	LAMP NO	LAMP WATTS	FIXTURE VOLTAGE	MOUNTING
B	2'X4' LED RECESSED LAY-IN LIGHT FIXTURE.	LITHONIA	2GTL-4-40L-EZ1-LP835	LED	–	30	MVOLT	RECESSED
B1	SAME AS TYPE 'B' WITH BATTERY PACK.	LITHONIA	2GTL-4-40L-EZ1-LP835-EL7L	LED	–	30	MVOLT	RECESSED
C	2'X4' RECESSED LED FLAT PANEL FIXTURE, 0-10V DIMMING CAPABILITIES.	LITHONIA	EPANL-2X4-5400LM-80CRI-35K-MIN1-ZT-MVOLT	LED	–	56	MVOLT	RECESSED
C1	SAME AS TYPE 'C', EXCEPT PROVIDE WITH EMERGENCY BATTERY PACK.	LITHONIA	EPANL-2X4-5400LM-80CRI-35K-MIN1-ZT-MVOLT-E10WCP	LED	–	56	MVOLT	RECESSED
D	6" DIMMABLE LED DOWNLIGHT, SEMI-SPECULAR REFLECTOR, CLEAR TRIM.	LITHONIA	LDN6-35/20-L06AR-LSS-MVOLT-EZ1	LED	–	26	MVOLT	RECESSED
E	SINGLE SIDED LED EXIT LIGHT WITH NICKEL CADMIUM BATTERY.	LITHONIA	LQM-S-W-3-R-120/277-ELN	LED	–	1	MVOLT	SURFACE
F	4' LED STRIP LIGHT WITH STEEL HOUSING, HIGH GLOSS BAKED WHITE ENAMEL FINISH, DIFFUSE ACRYLIC LENS.	LITHONIA	ZL1N-L48-5000LM-FST-35K-80CRI	LED	–	34	MVOLT	SURFACE
F1	SAME AS TYPE 'F', EXCEPT PROVIDE WITH EMERGENCY BATTERY PACK.	LITHONIA	ZL1N-L48-5000LM-FST-35K-80CRI-E7W	LED	–	34	MVOLT	SURFACE
G	EXTERIOR WALL SCONCE, ARCHITECT TO SELECT FINISH.	GARDCO LIGHTING	121-16L-700-NW-G3-2-UNV	LED	–	38	MVOLT	WALL MOUNT
H	4' LED STRIP LIGHT, IMPACT RESISTANT LENS.	LUMINAIRE LED	LVP524-48"-50W-3500K-120-277-CP-WHT-DIM	LED	–	53.7	MVOLT	SURFACE
H1	SAME AS TYPE 'H', EXCEPT PROVIDE WITH EMERGENCY BATTERY PACK.	LUMINAIRE LED	LVP524-48"-50W-3500K-120-277-CP-WHT-DIM-EMB310	LED	–	53.7	MVOLT	SURFACE

GENERAL ELECTRICAL NOTES:

A. PROVIDE ALL TEMPORARY EGRESS EXIT LIGHTING FIXTURES AS REQUIRED DURING CONSTRUCTION.

B. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING & REPLACING ACOUSTICAL LAY-IN CEILING FOR ROUTING OF FEEDERS, BRANCH CIRCUITS AND CABLING, UNLESS SPECIFICALLY NOTED OTHERWISE OR SHOWN ON ARCHITECTURAL DRAWINGS. ALL DAMAGED TILE SHALL BE REPLACED WITH NEW TILE TO MATCH EXISTING.

C. COORDINATE CONDUIT ROUTING WITH MECHANICAL CONTRACTOR TO AVOID CONFLICTS WITH EQUIPMENT AND EQUIPMENT CLEARANCE.

D. SEAL AROUND ALL RATED WALL PENETRATIONS WITH FIRE STOPPING.

E. FINAL CONNECTION TO ALL CEILING MOUNTED DEVICES SHALL BE MADE WITH FLEX CONDUIT.

F. COORDINATE LIGHTING FIXTURE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING DRAWINGS.

G. ALL LINE VOLTAGE BRANCH CIRCUITS AND RACEWAYS REQUIRED FOR EQUIPMENT IDENTIFIED AS OWNER FURNISHED IS THE RESPONSIBILITY OF THE CONTRACTOR.

H. REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT MOUNTING HEIGHTS AND LOCATIONS FOR ALL WIRING DEVICES.

I. VERIFY ALL EQUIPMENT LOCATIONS WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

J. COORDINATE LOCATION OF RECEPTACLES WITH VOICE/ DATA OUTLETS ON SYSTEMS DRAWINGS. VOICE/ DATA OUTLETS SHALL BE LOCATED ADJACENT TO RECEPTACLES.

K. ALL LINE VOLTAGE BRANCH CIRCUITS AND RACEWAYS REQUIRED FOR EQUIPMENT IDENTIFIED AS OWNER FURNISHED IS THE RESPONSIBILITY OF THE CONTRACTOR.

L. REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT MOUNTING HEIGHTS AND LOCATIONS FOR ALL WIRING DEVICES.

M. BRANCH CIRCUIT NEUTRAL CONDUCTORS SHALL NOT BE SHARED WITH ANOTHER CIRCUIT.

N. EACH BRANCH CIRCUIT SHALL BE EQUIPPED WITH A GREEN EQUIPMENT GROUNDING CONDUCTOR.

GENERAL ELECTRICAL REMOVAL NOTES

A. CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE BUILDING AND SITE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS. THESE REMOVAL DRAWINGS SHALL SERVE TO AID THE CONTRACTOR IN HIS EVALUATION OF THE DEMOLITION, BUT SHALL NOT BE HELD TO BE ALL INCLUSIVE.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REMOVALS REQUIRED FOR THE INSTALLATION OF NEW WORK, WHETHER OR NOT IT IS SPECIFICALLY INDICATED OR NOTED IN THESE DOCUMENTS.

C. ALL EQUIPMENTS INDICATED AS HATCHED OR AS NOTED SHALL BE DISCONNECTED AND REMOVED. ALL ITEMS WHICH ARE OF SALVAGEABLE VALUE TO THE OWNER SHALL BE REMOVED AS DIRECTED BY THE OWNER. IF ITEMS OF SALVAGEABLE VALUE ARE NOT DESIRED BY THE OWNER THEY SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED OR DISPOSED OF AS APPROPRIATE AND AS REQUIRED BY APPLICABLE LAW.

D. REMOVE ALL EXISTING CONDUIT AND CONDUCTORS FROM REMOVED EQUIPMENT UNLESS CIRCUITS ARE SERVING OTHER EQUIPMENT TO REMAIN.

E. IF PORTIONS OF CIRCUITS SERVING EQUIPMENT TO REMAIN MUST BE RELOCATED OR REMOVED DUE TO OTHER DEMOLITION OR DUE TO INTERFERENCE WITH NEW EQUIPMENT INSTALLATION, THE CIRCUITS SHALL BE MODIFIED IN A MANNER WHICH SHALL ENSURE PROPER OPERATION OF THE EQUIPMENT AFTER CONSTRUCTION IS COMPLETE. USE SAME GAUGE AND TYPE OF CONDUCTOR AND SAME CONDUIT SIZE AS EXISTING TO MAKE ALL REQUIRED CIRCUIT MODIFICATIONS.

F. IF WALLS, CEILINGS, FLOORS, OR EQUIPMENT ARE REMOVED OR OTHER DEMOLITION OCCURS, WHICH EXPOSES CIRCUITS SERVING EQUIPMENT TO REMAIN, THE CIRCUITS SHALL BE RELOCATED OR MODIFIED IN SUCH A MANNER WHICH SHALL ENSURE THE CONTINUED OPERATION OF THE CIRCUIT. EXISTING CONDUITS EXPOSED DURING DEMOLITION WHICH REMAIN TO SERVE EQUIPMENT SHALL BE RE-SUPPORTED IN ACCORDANCE WITH THE REQUIREMENTS FOR RACEWAY INSTALLATION IN THE SPECIFICATIONS.

G. PROVIDE BLANK FINISH PLATE FOR OUTLET BOX AFTER REMOVAL OF DEVICE IF OUTLET BOX IS TO REMAIN FOR CIRCUIT CONTINUITY.

H. ENSURE CIRCUIT CONTINUITY WHERE FIXTURES, DEVICES, ETC. ARE REMOVED/RELOCATED.

I. REMOVE LIGHTING FIXTURES IN SUCH A WAY THAT RE-USE OF FIXTURE AND WIRING IS POSSIBLE.

J. CIRCUIT CONDUIT AND WIRING ASSOCIATED WITH EQUIPMENT PERMANENTLY REMOVED OR DESIGNATED TO BE RELOCATED SHALL BE REMOVED COMPLETE BACK TO THE RESPECTIVE PANEL.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07423
Ronald P. Portadin AIA* AI-13088
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ELECTRICAL LEGEND, DETAILS, GENERAL NOTES

Scale	Job	Sheet
AS NOTED	19002	E0.1
Drawn: PTB	Date: 03/18/19	1 of 5

File Name: M:\Projects\MMPF\18280 - Cumberland County College Applied Engineering Bldg\Elec\VIEW\18280E01.dwg
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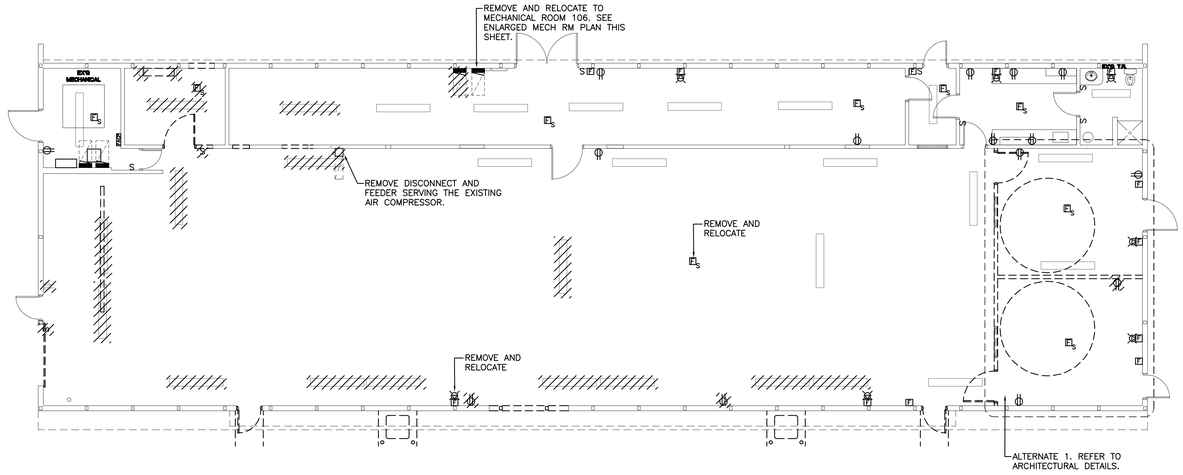
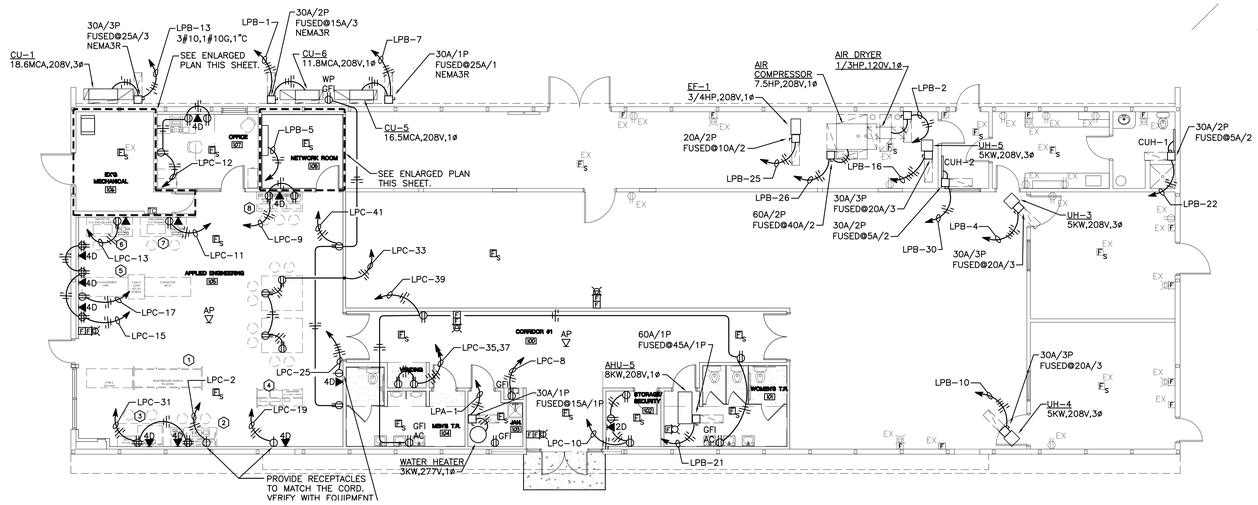
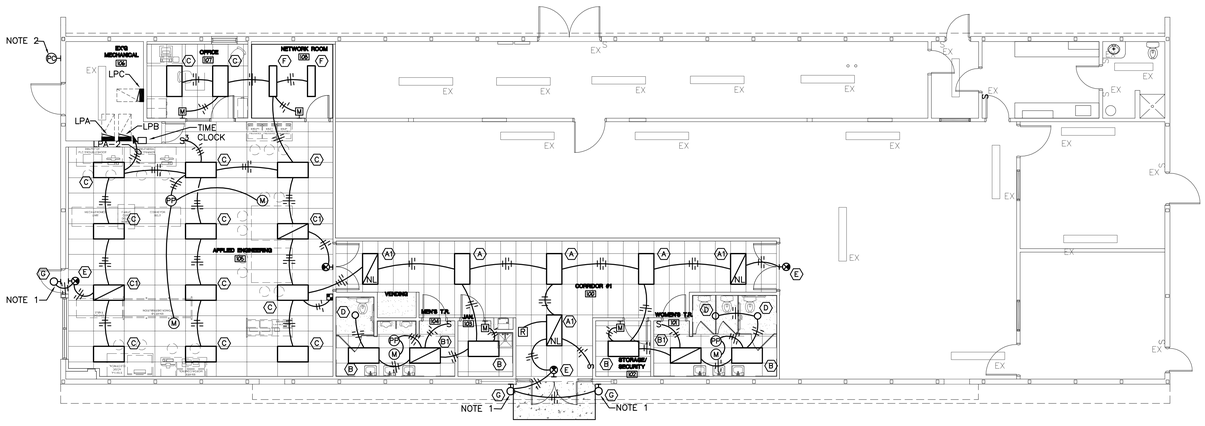
Layout Tab: E1.0
Plotted on: Mar 18, 2019 - 12:48pm Plotted by:odom



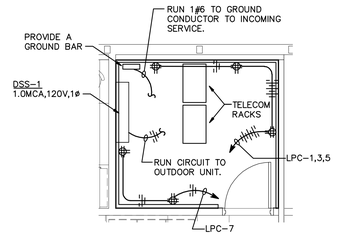
ELECTRICAL REMOVAL PLAN - BASE BID
SCALE: 1/8" = 1'-0"



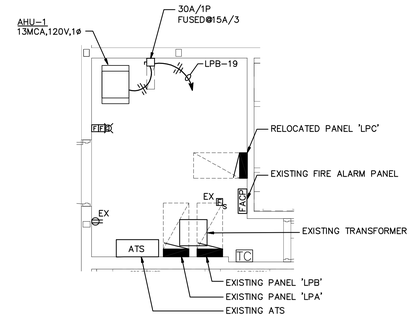
POWER & SYSTEMS PLAN - BASE BID
SCALE: 1/8" = 1'-0"



LIGHTING PLAN - BASE BID
SCALE: 1/8" = 1'-0"



ENLARGED NETWORK ROOM 108 POWER PLAN
SCALE: 1/4" = 1'-0"



ENLARGED MECHANICAL ROOM 106 POWER PLAN
SCALE: 1/4" = 1'-0"

CLASSROOM EQUIPMENT SCHEDULE

SYMBOL	DESCRIPTION	POWER REQUIREMENTS
1	POWER DISTRIBUTION LEARNING SYSTEM	6A,208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
2	ELECTRIC MOTOR CONTROL LEARNING SYSTEM	208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
3	AC/DC ELECTRICAL TRAINING SYSTEM	120v,1ø. CORD AND PLUG.
4	ELECTRICAL WIRING LEARNING SYSTEM	208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
5	FANUC CERT DELTA ROBOT	120V,1ø. CORD AND PLUG.
6	PORTABLE PLC TROUBLESHOOTING LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
7	PORTABLE PLC LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
8	PNEUMATICS LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
9	PLC LOGIC	2A,120V,1ø. CORD AND PLUG.

NOTES
1. EXTERIOR LIGHTING SHALL BE CONTROLLED BY REMOTE PHOTOCELL AND TIME CLOCK. ROUTE TO EMERGENCY CIRCUIT AS INDICATED. SEE LIGHTING CONTACTOR DIAGRAM ON SHEET E4.0.
2. PHOTOCELL SHALL BE MOUNTED AWAY FROM ARTIFICIAL LIGHTING.

GENERAL NOTES:
A. REFER TO SHEET E0.1 FOR ELECTRICAL REMOVAL NOTES.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

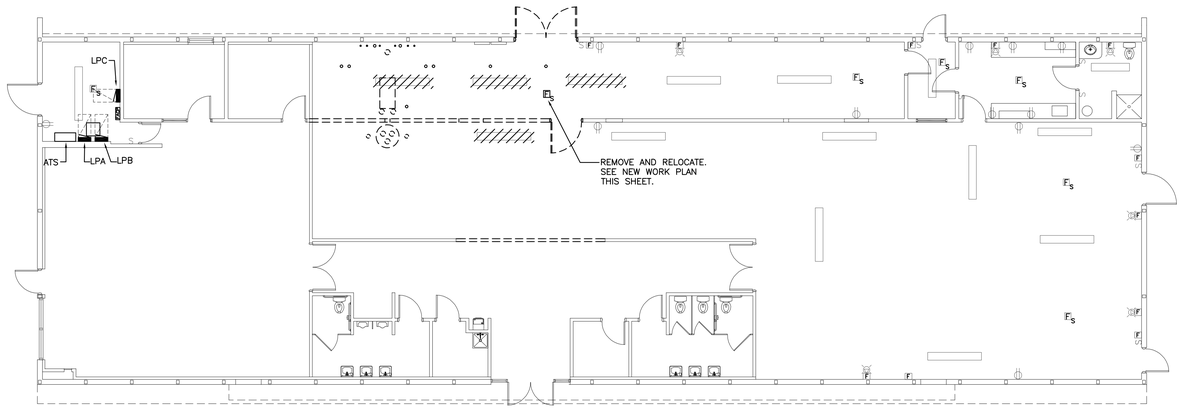
CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

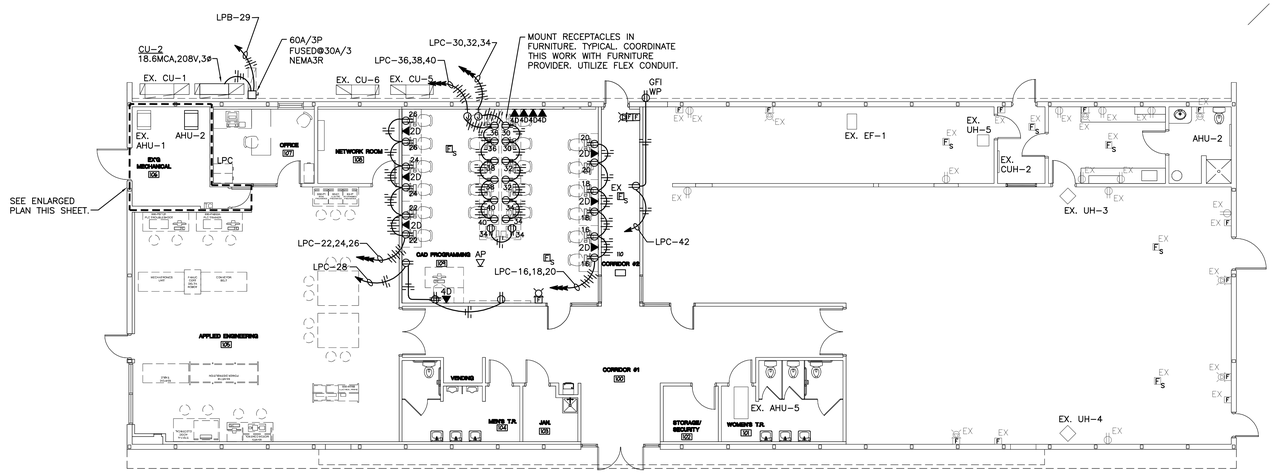
FIRST FLOOR BASE BID LIGHTING, POWER AND SYSTEMS PLAN

Scale	Job	Sheet
AS NOTED	19002	E1.0
Drawn: PTB	Date: 03/18/19	2 of 5

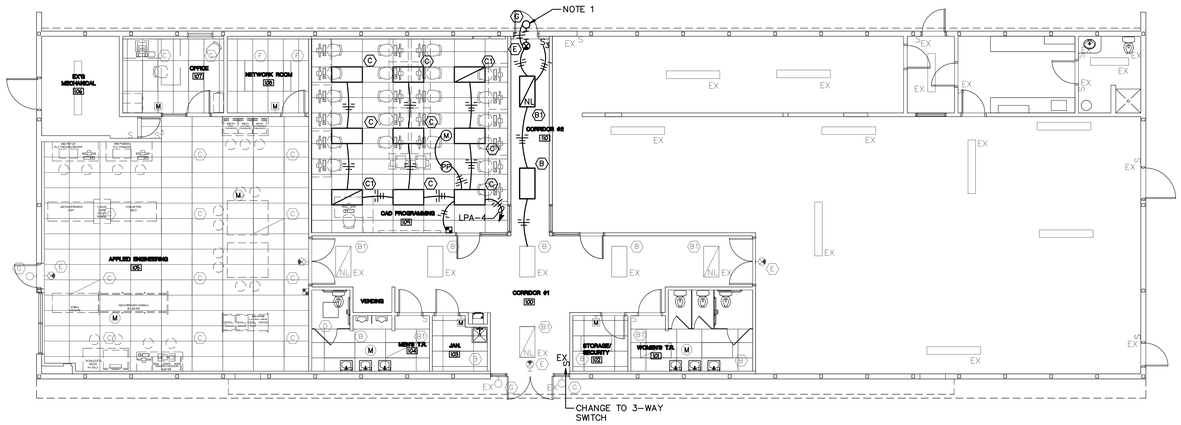
File Name: M:\Projects\MMPF\18280 - Cumberland County College Applied Engineering Bldg\Dwg\NEW\18280E10.dwg Plotted on: Mar 18, 2019 - 12:49pm Plotted by:odom
Xrefs: 18280A001-BASE BID.dwg 18280A001.dwg 18280P001.dwg 18280S001.dwg 18280A001-HatMat.dwg
Layout Tab: E1.0



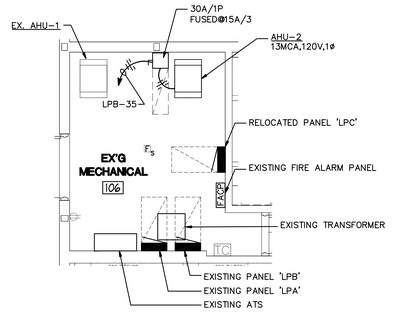
ELECTRICAL REMOVAL PLAN - ALTERNATE 2
SCALE: 1/8" = 1'-0"



POWER & SYSTEMS PLAN - ALTERNATE 2
SCALE: 1/8" = 1'-0"



LIGHTING PLAN - ALTERNATE 2
SCALE: 1/8" = 1'-0"



ENLARGED MECHANICAL ROOM 106 POWER PLAN
SCALE: 1/4" = 1'-0"

NOTES

1. EXTERIOR LIGHTING SHALL BE CONTROLLED BY REMOTE PHOTOCELL AND TIME CLOCK. ROUTE TO EMERGENCY CIRCUIT AS INDICATED. SEE LIGHTING CONTACTOR DIAGRAM ON SHEET E4.0.

GENERAL NOTES:

A. REFER TO SHEET E0.1 FOR ELECTRICAL REMOVAL NOTES.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing		
FIRST FLOOR ALTERNATE 2 LIGHTING, POWER AND SYSTEMS PLAN		
Scale AS NOTED	**Job** 19002	**Sheet** E2.0
Drawn PTB	**Date** 03/18/19	3 of 5

B.C.C.L.E., INC.
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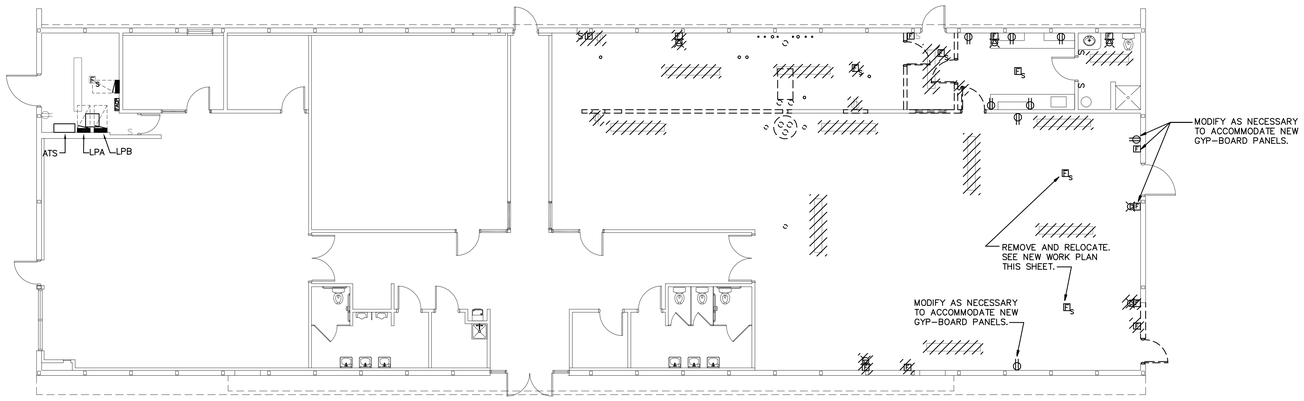
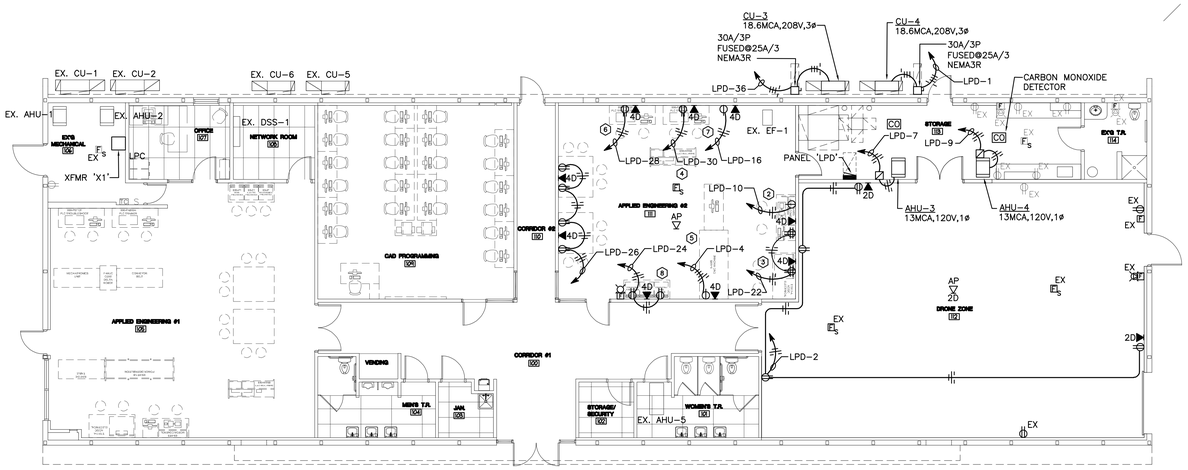


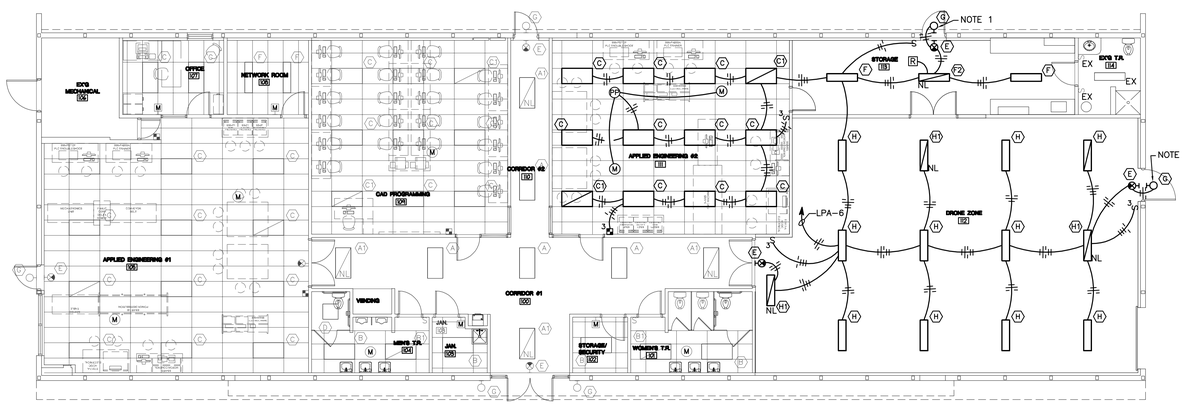
ELECTRICAL REMOVAL PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"



POWER & SYSTEMS PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"



LIGHTING PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"

CLASSROOM EQUIPMENT SCHEDULE

SYMBOL	DESCRIPTION	POWER REQUIREMENTS
1	NOT USED	--
2	ELECTRIC MOTOR CONTROL LEARNING SYSTEM	208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
3	AC/DC ELECTRICAL TRAINING SYSTEM	120v,1ø. CORD AND PLUG.
4	ELECTRICAL WIRING LEARNING SYSTEM	208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
5	5-AXIS CNC MACHINE	208V,3ø. CORD AND PLUG. PROVIDE 20A MATCHING RECEPTACLE.
6	PORTABLE PLC TROUBLESHOOTING LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
7	PORTABLE PLC LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
8	PNEUMATICS LEARNING SYSTEM	120V,1ø. CORD AND PLUG.
9	NOT USED	--

NOTES

1. EXTERIOR LIGHTING SHALL BE CONTROLLED BY REMOTE PHOTOCELL AND TIME CLOCK. ROUTE TO EMERGENCY CIRCUIT AS INDICATED. SEE LIGHTING CONTROL WIRING DIAGRAM ON SHEET E4.0.

GENERAL NOTES:

A. REFER TO SHEET E0.1 FOR ELECTRICAL REMOVAL NOTES.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY - REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 - RECONSTRUCTION

USE GROUP: B - BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

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Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing FIRST FLOOR ALTERNATE 3 LIGHTING, POWER AND SYSTEMS PLAN		
Scale AS NOTED	**Job** 19002	**Sheet** E3.0
Drawn PTB	**Date** 03/18/19	4 of 5

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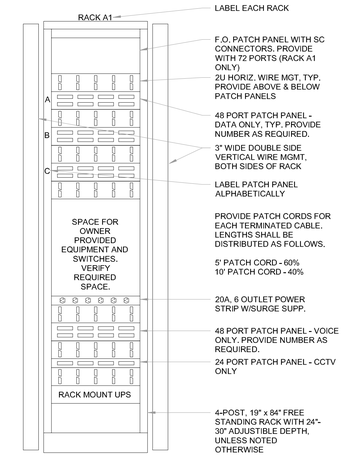
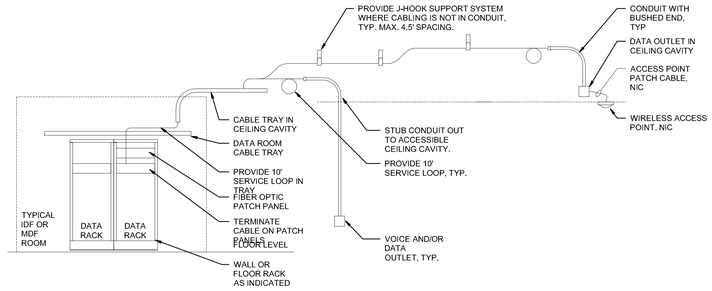
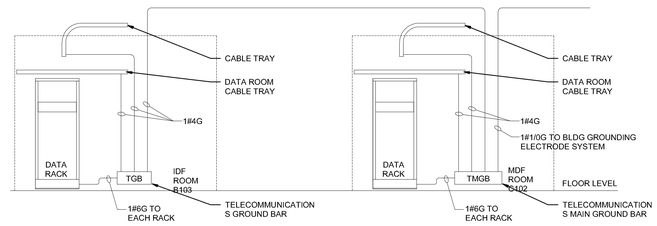


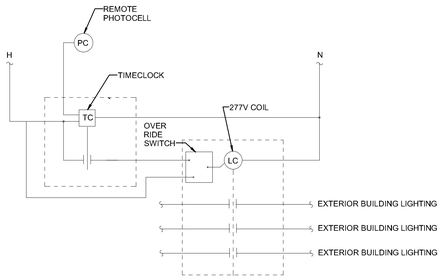
TYPICAL TELECOM RACK ELEVATION
SCALE: NONE



VOICE/DATA SYSTEM WIRING DIAGRAM
SCALE: NONE

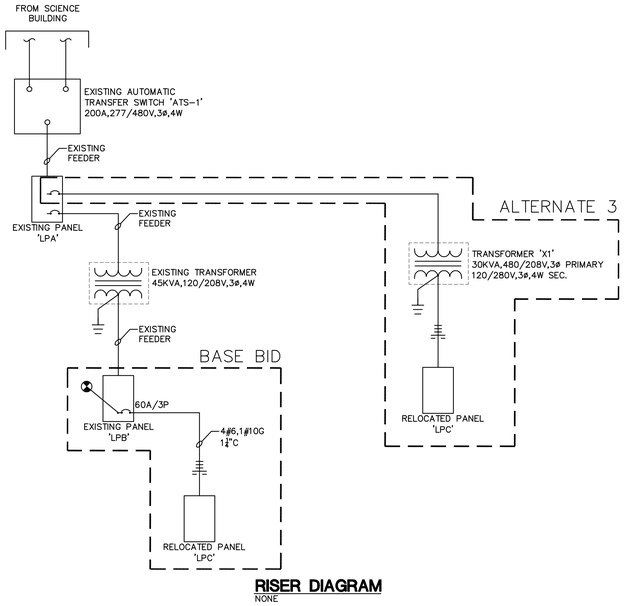


IT ROOM GROUNDING DETAIL
NONE



LIGHTING CONTACTOR - LC1
SCALE: NONE

GENERAL NOTES
A. EXTERIOR BUILDING LIGHTING FIXTURES SHALL BE PHOTOCELL ON AND TIME CLOCK OFF. PROVIDE AN EMERGENCY RELAY AHEAD OF TIME CLOCK TO CONTROL EXTERIOR EGRESS LIGHTS (TYPE G).



RISER DIAGRAM
NONE

PANEL NAME: LPA — MAINS: XXXA MLO — MOUNTING:SURFACE
PANEL RATING: 480Y/277V, 3PH, 4WIRE — KAIC RATING: 10 — SPACES: 42

CIRCUIT NUMBER	LOAD DESCRIPTION	CONNECTED LOAD	BREAKER SIZE/POLES	WIRE SIZE	A	B	C	WIRE SIZE	BREAKER SIZE/POLES	CONNECTED LOAD	LOAD DESCRIPTION	CIRCUIT NUMBER
1	WATER HEATER		30/1		X				20/1	1352	LIGHTING - RM. 101,104,105,107	2
3			20/1			X			20/1	729	LIGHTING - RM.103,110	4
5			20/1				X		20/1	1546	LIGHTING - RM.103,110	6
7			20/1		X				20/1			8
9			20/1			X			20/1			10
11			20/1				X		20/1			12
13			20/1		X				20/1			14
15			20/1			X			20/1			16
17			20/1				X		20/1			18
19			20/1		X				20/1			20
21			20/1			X			20/1			22
23			20/1				X		20/1			24
25			20/1		X				20/1			26
27			20/1			X			20/1			28
29			20/1				X		20/1			30
31			20/1		X				20/1			32
33			20/1			X			20/1			34
35							X					36
37					X							38
39						X						40
41							X					42

TOTAL: 0 VA — TOTAL: 3628 VA
TOTAL CONNECTED LOAD: 3628 VA
REMARKS:

PANEL NAME: LPB — MAINS: XXXA MLO — MOUNTING:SURFACE
PANEL RATING: 208Y/120V, 3PH, 4WIRE — KAIC RATING: 10 — SPACES: 42

CIRCUIT NUMBER	LOAD DESCRIPTION	CONNECTED LOAD	BREAKER SIZE/POLES	WIRE SIZE	A	B	C	WIRE SIZE	BREAKER SIZE/POLES	CONNECTED LOAD	LOAD DESCRIPTION	CIRCUIT NUMBER
1	CU-6	1280	20/2		X				20/1	500	DRYER	2
3		1280				X			30/3	1700	UH-3	4
5	DSS-1	200	20/1				X			1700		6
7	CU-5	1380	20/2		X					1700		8
9		1380				X			30/3	1700	UH-4	10
11			20/1				X			1700		12
13	CU-1	1820	30/3		X					1700		14
15		1820				X			30/3	1700	UH-5	16
17		1820					X			1700		18
19	AHU-1	1490	20/1		X					1700		20
21	AHU-5	4000	50/2			X			30/2	375	CUH-1	22
23		4000					X			375		24
25	EF-1	700	20/2		X				40/2	4160	COMPRESSOR	26
27		700				X				4160		28
29	CU-2	1820	30/3				X		30/2	375	CUH-2	30
31		1820			X					375		32
33		1820				X						34
35	AHU-2	1490	20/1				X					36
37			20/1		X				75/3	6000	PANEL LPC	38
39			20/1			X				6000		40
41			20/1				X			6000		42

TOTAL: 28820 VA — TOTAL: 43620 VA
TOTAL CONNECTED LOAD: 72440 VA
REMARKS:

PANEL NAME: LPC — MAINS: XXXA MLO — MOUNTING:SURFACE
PANEL RATING: 208Y/120V, 3PH, 4WIRE — KAIC RATING: 10 — SPACES: 42

CIRCUIT NUMBER	LOAD DESCRIPTION	CONNECTED LOAD	BREAKER SIZE/POLES	WIRE SIZE	A	B	C	WIRE SIZE	BREAKER SIZE/POLES	CONNECTED LOAD	LOAD DESCRIPTION	CIRCUIT NUMBER
1	RECEPT - RM 108	500	20/1		X				20/3	500	RECEPT - 105	2
3	RECEPT - RM 108	500	20/1			X				500		4
5	RECEPT - RM 108	500	20/1				X			500		6
7	RECEPT - RM 108	1000	20/1		X				20/1	200	RECEPT - CORR 100	8
9	RECEPT - RM 105	400	20/1			X			20/1	600	RECEPT - RM 102	10
11	RECEPT - RM 105	200	20/1				X		20/1	600	RECEPT - RM 107	12
13	RECEPT - RM 105	200	20/1		X				20/1	400	RECEPT - CORR 2	14
15	RECEPT - RM 105	1500	20/1			X			20/1	400	RECEPT - RM 109	16
17	RECEPT - RM 105	400	20/1				X		20/1	400	RECEPT - RM 109	18
19	RECEPT - RM 105	500	20/3		X				20/1	400	RECEPT - RM 109	20
21		500				X			20/1	400	RECEPT - RM 109	22
23		500					X		20/1	400	RECEPT - RM 109	24
25	RECEPT - RM 105	500	20/3		X				20/1	400	RECEPT - RM 109	26
27		500				X			20/1	400	RECEPT - RM 109	28
29		500					X		20/1	400	RECEPT - RM 109	30
31	RECEPT - RM 105	400	20/1		X				20/1	400	RECEPT - RM 109	32
33	RECEPT - RM 105	800	20/1			X			20/1	400	RECEPT - RM 109	34
35	RECEPT - VENDING	200	20/1				X		20/1	400	RECEPT - RM 109	36
37	RECEPT - VENDING	200	20/1		X				20/1	400	RECEPT - RM 109	38
39	RECEPT - CORR 1	800	20/1			X			20/1	400	RECEPT - RM 109	40
41	RECEPT - RM 105	400	20/1				X		20/1	400	RECEPT - CORR 2	42

TOTAL: 11000 VA — TOTAL: 8900 VA
TOTAL CONNECTED LOAD: 19900 VA
REMARKS:

PANEL NAME: LPD — MAINS: XXXA MLO — MOUNTING:SURFACE
PANEL RATING: 208Y/120V, 3PH, 4WIRE — KAIC RATING: 10 — SPACES: 42

CIRCUIT NUMBER	LOAD DESCRIPTION	CONNECTED LOAD	BREAKER SIZE/POLES	WIRE SIZE	A	B	C	WIRE SIZE	BREAKER SIZE/POLES	CONNECTED LOAD	LOAD DESCRIPTION	CIRCUIT NUMBER
1	CU-4	1820	30/3		X				20/1	800	RECEPT - RM 112	2
3		1820				X			20/3	500	RECEPT - RM 111	4
5		1820					X			500		6
7	AHU-3	1490	20/1		X					500		8
9	AHU-4	1490	20/1			X			20/3	500	RECEPT - RM 111	10
11			20/1				X			500		12
13			20/1		X					500		14
15			20/1			X			20/3	500	RECEPT - RM 111	16
17			20/1				X			500		18
19			20/1		X					500		20
21			20/1			X			20/1	1000	RECEPT - RM 111	22
23			20/1				X		20/1	400	RECEPT - RM 111	24
25			20/1		X				20/1	800	RECEPT - RM 111	26
27			20/1			X			20/1	200	RECEPT - RM 111	28
29			20/1				X		20/1	200	RECEPT - RM 111	30
31			20/1		X				20/1			32
33			20/1			X			20/1			34
35			20/1				X		30/3	1820	CU-3	36
37			20/1		X							38
39			20/1			X				1820		40
41			20/1				X		20/1			42

TOTAL: 8440 VA — TOTAL: 13360 VA
TOTAL CONNECTED LOAD: 21800 VA
REMARKS:

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13039
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

ELECTRICAL DETAILS AND PANEL SCHEDULES

Scale	Job	Sheet
AS NOTED	19002	E4.0
Drawn: PTB	Date: 03/18/19	5 of 5

File Name: M:\Projects\MMPF\18280 - Cumberland County College Applied Engineering Bldg\Dwg\Exec\VIEW\18280E40.dwg
Xref Name: 18280E40.dwg
Layout Tab: E40
Plotted on: Mar 18, 2019 – 12:55pm Plotted by:cdorn

SCHEDULE OF ELECTRIC CABINET HEATERS

SYMBOL	MANUFACTURER	MODEL	HEATING CAPACITY (kW)	ELECTRICAL CHARACTERISTICS	REMARKS
CUH-1	QMARK	HBB758	0.75	208/1	ALL
CUH-2	QMARK	HBB758	0.75	208/1	ALL

NOTES:
1. PROVIDE WITH INTEGRAL THERMOSTAT.
2. PROVIDE WITH DISCONNECT SWITCH AND OVERLOAD PROTECTION.

SCHEDULE OF ELECTRIC UNIT HEATERS

SYMBOL	MANUFACTURER	MODEL	HEATING CAPACITY (kW)	CFM	MAX DELTA T (F)	MOTOR H.P.	RPM	ELECTRICAL CHARACTERISTICS	REMARKS
UH-3	QMARK	IUH-520	5	500	60	1/10	1,400	208/3	ALL
UH-4	QMARK	IUH-520	5	500	60	1/10	1,400	208/3	ALL
UH-5	QMARK	IUH-520	5	500	60	1/10	1,400	208/3	ALL

NOTES:
1. PROVIDE WITH INTEGRAL THERMOSTAT.
2. PROVIDE WITH DISCONNECT SWITCH AND OVERLOAD PROTECTION.

SCHEDULE OF GRILLES & DIFFUSERS

SYMBOL	MANUFACTURER	MODEL	PANEL SIZE	CORE TYPE	INLET DIMENSION	NOMINAL CFM	THROW @100 FPM	PRESSURE DROP(IN.)	SOUND N.C.	MOUNTING	REMARKS
S-1	TITUS	OMNI	24X24	PLAQUE	8"ø	244	5	0.055	12	LAY-IN	1,2
S-2	TITUS	OMNI	24X24	PLAQUE	10"ø	436	8	0.107	20	LAY-IN	1,2
S-3	TITUS	DL	18X6	LOUVERED	12"ø	333	21	0.080	11	DUCT	1,3
R-1	TITUS	PAR	24X24	PERFORATED	22X22	1008	–	0.03	13	LAY-IN	1,2
R-2	TITUS	350RL	18X18	LOUVERED	16X16	810	–	0.022	14	SIDEWALL	1,2
E-1	TITUS	PAR	24X24	PERFORATED	22X22	1008	–	0.03	13	LAY-IN	1,2
E-2	TITUS	PAR	12X12	PERFORATED	10X10	278	–	0.06	23	SURFACE	1,2
TG-1	TITUS	PAR	12X12	PERFORATED	10X10	347	–	0.09	29	SURFACE	1,2

NOTES:
1. COLOR SHALL BE AS DIRECTED BY ARCHITECT.
2. CONTRACTOR SHALL VERIFY CEILING TYPE PRIOR TO ORDERING.
3. DRUM LOUVER TO BE INSTALLED AT 30° ANGLE ON DUCT.

SCHEDULE OF LOUVERS

SYMBOL	MANUFACTURER	MODEL	TYPE	CFM	PRESSURE DROP (IN.)	VELOCITY (FPM)	FREE AREA (SF)	DUCT CONNECTION SIZE (IN.)	MOUNTING	REMARKS
L-1	GREENHECK	ESD-635	DRAINABLE	1,100	0.08	749	1.35	26X20X6	SIDEWALL	ALL
L-2	GREENHECK	ESD-635	DRAINABLE	350	0.05	561	0.62	16X16X6	SIDEWALL	1
L-3	GREENHECK	ESD-635	DRAINABLE	400	0.04	490	0.82	16X20X6	SIDEWALL	ALL

NOTES:
1. PROVIDE WITH BIRDSCREEN.
2. PROVIDE WITH MOTORIZED DAMPER.
3. MOTORIZED DAMPER TO BE CONTROLLED BY 24-HOUR PROGRAMMABLE TIME CLOCK LOCATED IN MECHANICAL ROOM.

SCHEDULE OF EXHAUST FANS

SYMBOL	MANUFACTURER	AREA SERVED	TYPE	SIZE	HP	FRPM	CFM	E.S.P. (IN H_2O)	FAN MOUNTING	ELECTRICAL CHARACTERISTICS	REMARKS
EF-1	GREENHECK	RESTROOMS/JANITOR	SQ	98-VG	3/4	1,723	350	1	IN-LINE	208/1	ALL

NOTES:
1. FURNISH WITH BACKDRAFT DAMPER, DISCONNECT, AND FAN MOTOR SPEED DIAL.
2. EXHAUST FAN TO BE CONTROLLED BY 24-HOUR PROGRAMMABLE TIME CLOCK LOCATED IN MECHANICAL ROOM.

SCHEDULE OF DUCTLESS SPLIT SYSTEMS

SYMBOL	MANUFACTURER	MODEL INDOOR/ OUTDOOR	COOLING CAPACITY (BTUH)	CFM	REFRIG	MIN. OPERATING. TEMP.	MIN. EFFICIENCY (SEER)	ELECTRICAL CHARACTERISTICS	MCA (IN/OUT)	REMARKS
DSS-1/CU-6	CARRIER	40MKCB18B3/ 24AHA418A003	18,000	1,285	R-410A	-20	14.0	208/1	1.0/11.8	ALL

NOTES:
1. PROVIDE WITH REMOTE MOUNTED LCD DISPLAY WITH TEMPERATURE SETTING AND FAN SPEED CONTROL.
2. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS.
3. PROVIDE WITH LOW AMBIENT WIND BAFFLE AND CONTROLS.
4. PROVIDE WITH DISCONNECT.

SCHEDULE OF ELECTRIC FURNACES

SYMBOL	MANUFACTURER	MODEL	CFM	HEATING CAPACITY (kW)	MOTOR H.P.	E.S.P. (IN H_2O)	ELECTRICAL CHARACTERISTICS	REMARKS
AHU-5	CARRIER	KFCEH0801N08	800	8	1/3	0.6	208/1	ALL

NOTES:
1. PROVIDE WITH DISCONNECT SWITCH/OVERLOAD.
2. PROVIDE ALL DAMPERS, SENSORS, AND CONTROL COMPONENTS AS REQUIRED.

SCHEDULE OF GAS FIRED FURNACES

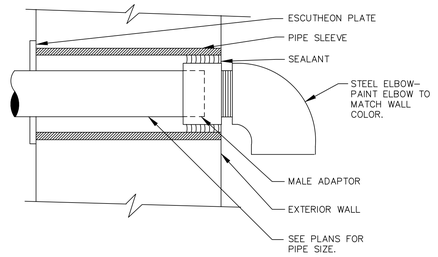
SYMBOL	MANUFACTURER	MODEL	CFM	GAS (BTUH)		GAS PRESSURE (IN. WC)	MOTOR H.P.	E.S.P. (IN H_2O)	ELECTRICAL CHARACTERISTICS	MCA	REMARKS
				INPUT	OUTPUT						
AHU-1	CARRIER	59SP5A080E21	1,360	80,000	78,000	4.5-13.6	1	1.0	115/1	13.0	ALL
AHU-2	CARRIER	59SP5A080E21	1,360	80,000	78,000	4.5-13.6	1	1.0	115/1	13.0	ALL
AHU-3	CARRIER	59SP5A080E21	1,360	80,000	78,00	4.5-13.6	1	1.0	115/1	13.0	ALL
AHU-4	CARRIER	59SP5A080E21	1,360	80,000	78,000	4.5-13.6	1	1.0	115/1	13.0	ALL

NOTES:
1. PROVIDE WITH DISCONNECT SWITCH/OVERLOAD.
2. PROVIDE ALL DAMPERS, SENSORS, AND CONTROL COMPONENTS AS REQUIRED.
3. PROVIDE WITH CONCENTRIC VENT KIT OR EQUIVALENT.

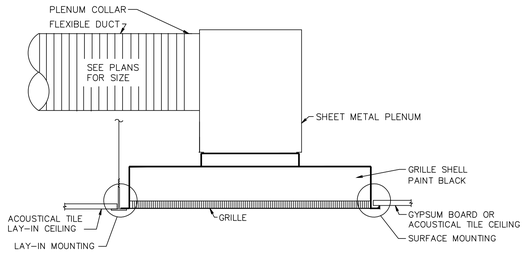
SCHEDULE OF SPLIT SYSTEM AIR CONDITIONERS

SYMBOL	MANUFACTURER	MODEL INDOOR/ OUTDOOR	COOLING CAPACITY (BTUH)	CFM	OA CFM	REFRIG	MIN. EFFICIENCY (SEER)	E.S.P. (IN H_2O)	ELECTRICAL CHARACTERISTICS	MCA OUT	REMARKS
AHU-1/CU-1	CARRIER	CNPVP48/ 25HHA448	42,200	1,600	350	R-410A	14.0	1.0	208/3	18.6	ALL
AHU-2/CU-2	CARRIER	CNPVP48/ 25HHA448	42,200	1,600	310	R-410A	14.0	1.0	208/3	18.6	ALL
AHU-3/CU-3	CARRIER	CNPVP48/ 25HHA448	42,200	1,600	350	R-410A	14.0	1.0	208/3	18.6	ALL
AHU-4/CU-4	CARRIER	CNPVP48/ 25HHA448	42,200	1,600	100	R-410A	14.0	1.0	208/3	18.6	ALL
AHU-5/CU-5	CARRIER	FB4CNP030/ 25HHA424	22,000	800	350	R-410A	14.0	1.0	208/1	16.5	ALL

NOTES:
1. PROVIDE WITH REMOTE MOUNTED LCD DISPLAY WITH TEMPERATURE SETTING AND FAN SPEED CONTROL.
2. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS.
3. PROVIDE DISCONNECT FOR CONDENSING UNIT.
4. PROVIDE WITH CONDENSATE PUMP.

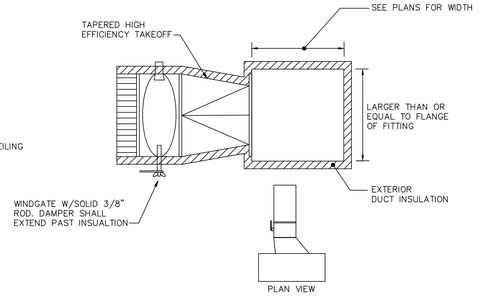


CONDENSATE DRAIN WALL PENETRATION DETAIL
SCALE: NONE



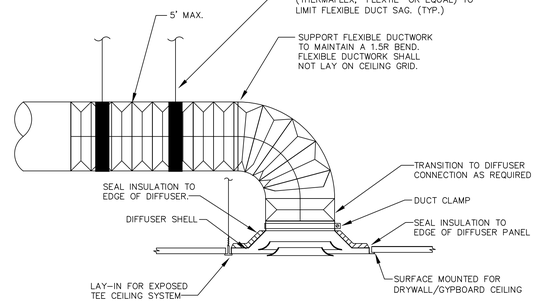
NOTES:
1. PROVIDE VOLUME DAMPER IN BRANCH DUCT FOR EACH GRILLE

RETURN/EXHAUST GRILLE CONNECTION DETAIL
SCALE: NONE



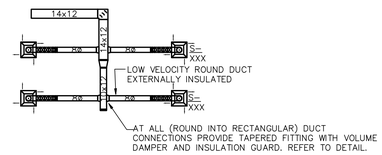
NOTE:
1. MINIMUM OF 6 SCREWS SHALL BE USED TO SECURE TO DUCT MAIN.
2. GSI HETOs ARE DESIGNED AND TESTED TO SURPASS SMACNA CLASS 3 LEAKAGE STANDARDS.
3. PRE-SEALED WITH GASKET MADE FROM EPDM RUBBER AND PROPRIETARY CO-POLYMER.

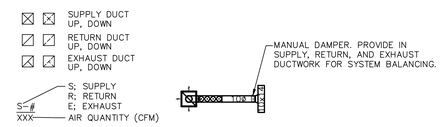
TAPERED FITTING W/ DAMPER DETAIL
SCALE: NONE



NOTES:
1. PROVIDE VOLUME DAMPER IN BRANCH DUCT FOR EACH GRILLE

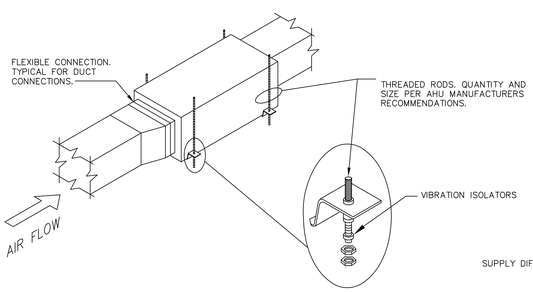
SUPPLY DIFFUSER CONNECTION DETAIL
SCALE: NONE





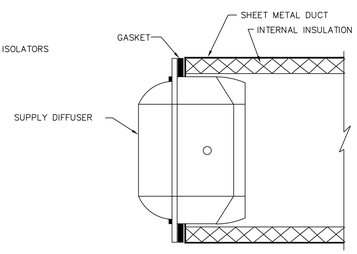
NOTES:
1. ALL LOW PRESSURE DUCTWORK DIMENSIONS ARE SHEET METAL DIMENSIONS.
2. EXTERNALLY INSULATE ALL O.A. DUCTWORK AND S.A. DUCTWORK.
3. EXTERNALLY INSULATE ALL EXPOSED R.A. DUCTWORK.
4. SECURELY ATTACH FLEXIBLE DUCT TO DIFFUSERS WITH SCREWS.

HVAC DUCT LEGEND
SCALE: NONE

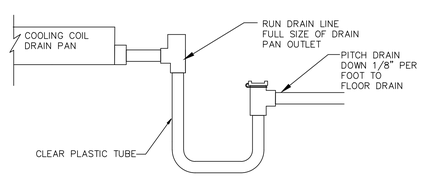


NOTES:
1. PROVIDE SUPPORT CHANNELS/BEAMS FOR UNITS SUPPORTED FROM OVER-HEAD JOISTS.
2. PROVIDE THREADED RODS, VIBRATION ISOLATORS, AND ALL REQUIRED MOUNTING HARDWARE AS RECOMMENDED BY AHU MANUFACTURER.
3. REFER TO MANUFACTURERS INSTALLATION INSTRUCTIONS AND OPERATING WEIGHTS.
4. HANG UNIT TO PROVIDE MANUFACTURERS RECOMMENDED SERVICE CLEARANCES.

AHU-5/EF-1 MOUNTING DETAIL
SCALE: NONE



DRUM LOUVER DETAIL
SCALE: NONE



CONDENSATE DRAIN DETAIL
SCALE: NONE

1. CONDENSATE TRAP SHALL BE EZ-TRAP OR EQUAL.

GENERAL NOTES:

A. PROPER CONNECTIONS, MATERIALS, AND SIZES OF DUCTWORK SHALL BE MAINTAINED TO ENSURE EQUIPMENT IS MADE FULLY OPERATIONAL.

B. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR LOCATION OF GRILLES AND DIFFUSERS.

C. FOR ALL RATED WALLS THAT ARE EXTENDED TO STRUCTURE PROVIDE SLEEVES FOR NEW AND EXISTING PIPING AND DUCTWORK PENETRATING WALLS PER SPECS. REFER TO LIFE SAFETY PLANS.

D. PROVIDE FIRE OR FIRE/SMOKE DAMPERS AT ALL RATED WALLS. REFER TO LIFE SAFETY PLANS FOR WALL RATINGS AND LOCATIONS.

E. ALL FIRE, FIRE/SMOKE DAMPERS, REHEAT COILS, TURNING VANES AND OTHER DUCT MOUNTED ACCESSORIES SHALL ACCESS DOORS, LOCATED UPSTREAM OF THE DEVICE.

F. DRAWING IS DIAGRAMMATIC, PROVIDE ADDITIONAL OFFSETS, TRANSITIONS, ETC. AS REQUIRED TO AVOID INTERFERENCE'S ENCOUNTERED. RELOCATION OF EXISTING DUCT AND EQUIPMENT HANGERS REQUIRED FOR INSTALLATION WORK SHALL BE CONSIDERED PART OF THIS CONTRACT.

G. CONTRACTOR SHALL PROVIDE MANUFACTURER'S RECOMMENDED ACCESS TO ALL EQUIPMENT AND VALVES. ACCESS SHALL BE REMOVABLE BY CEILING TILES AND CEILING ACCESS PANELS. COORDINATE LOCATION OF MECHANICAL EQUIPMENT WITH OTHER TRADES TO AVOID CONFLICT.

HVAC SYMBOLS AND ABBREVIATIONS LEGEND

NOTE: NOT ALL SYMBOLS MAY BE USED.

A.F.F.	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ASSOC.	ASSOCIATED
AUTO.	AUTOMATIC
BHP	BRAKE HORSEPOWER
BTUH	BTU/HR
CAP.	CAPACITY
CC	COOLING COIL
CV	CONSTANT VOLUME
DN.	DOWN
DIA.	DIAMETER
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
ENT.	ENTERING
ESP	EXTERNAL STATIC PRESSURE
EXH.	EXHAUST
EX'G.	EXISTING
EXT.	EXTERNAL
FCU	FAN COIL UNIT
FD	FIRE DAMPER
LAT	LEAVING AIR TEMPERATURE
MAX.	MAXIMUM
MECH.	MECHANICAL
MIN.	MINIMUM
O.A.	OUTSIDE AIR
PRESS.	PRESSURE
R.A.	RETURN AIR
REF.	REFERENCE
RF	RETURN FAN
RM.	ROOM
S.A.	SUPPLY AIR
SF	SUPPLY FAN
SHT.	SHEET
S.P.	STATIC PRESSURE
T.C.	TEMPERATURE CONTROL
TSP	TOTAL STATIC PRESSURE
TYP.	TYPICAL
UH	UNIT HEATER
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
—REF—	REFRIGERANT PIPING
— CD —	CONDENSATE DRAIN PIPING
—HWS—	HOT WATER SUPPLY PIPING
—HWR—	HOT WATER RETURN PIPING
T	THERMOSTAT
CO	CARBON MONOXIDE SENSOR

Revisions

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David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

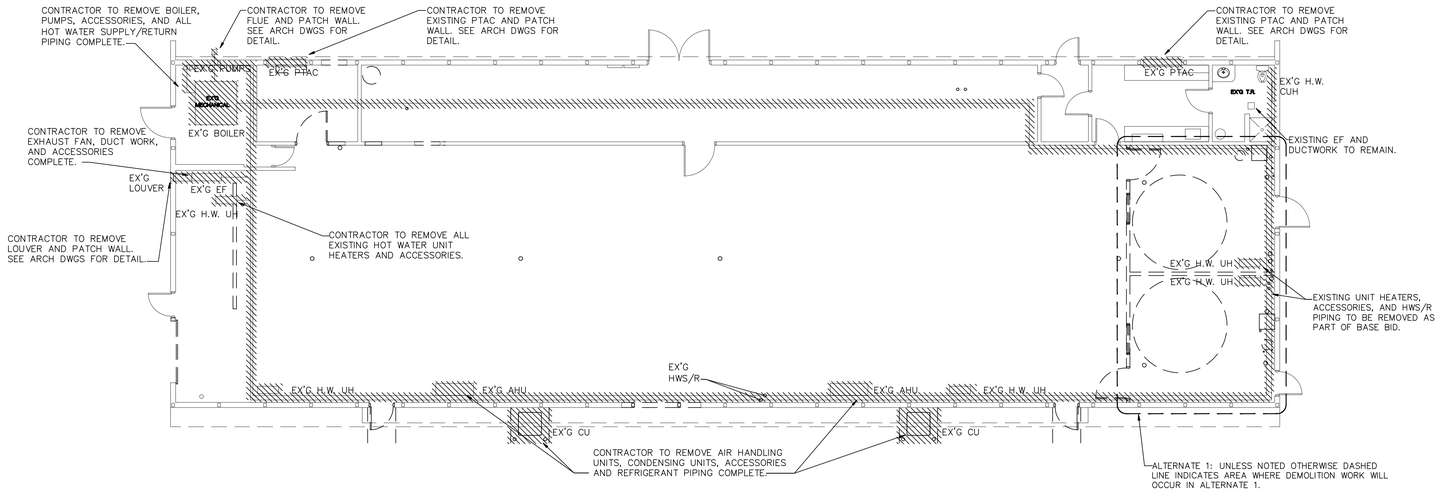
CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

HVAC LEGEND AND SCHEDULES

Scale	Job	Sheet
AS NOTED	19002	M0.1
Drawn: TLP	Date: 03/18/19	1 of 4

File Name: M:\Projects\MMPF\18280 - Cumberland County College Applied Engineering Bldg\HVAC\18280M0.1 HVAC LEGEND AND SCHEDULES.dwg Plotted on: Mar 15, 2019 – 2:53pm Plotted by:palombo
Model: M0.1 Drawing
Layout Tab: M0.1



FIRST FLOOR HVAC REMOVAL PLAN - BASE BID

SCALE: 1/8" = 1'-0"

DEMO NOTES:

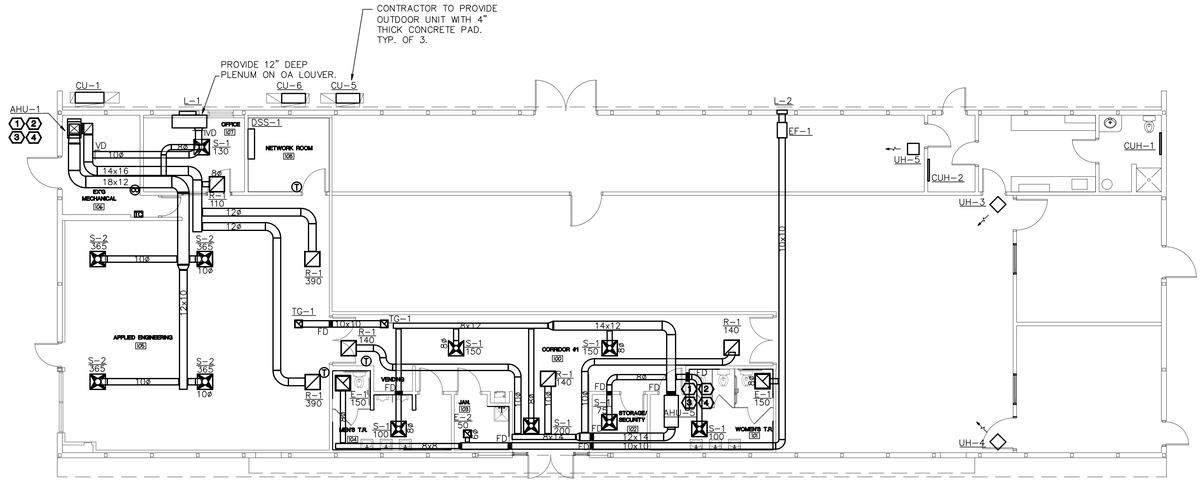
A. THE REMOVAL DRAWINGS SHALL SERVE TO AID THE CONTRACTOR IN THE EVALUATION OF THE EXTENT OF REMOVALS, BUT SHALL NOT BE HELD TO BE ALL INCLUSIVE.

B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE AREA TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS. VERIFY SIZE, LOCATION, AND USAGE OF EXISTING UTILITIES PRIOR TO REMOVAL. FOR FURTHER INFORMATION WITH REGARD TO THE EXTENT OF REMOVALS, SEE THE CONSTRUCTION DRAWINGS AND THE ARCHITECTURAL DRAWINGS WHICH SHOW WORK TO BE PERFORMED.

C. CUT, PATCH & REPAIR ALL OPENINGS IN WALLS, FLOORS, CEILINGS, ETC. WHERE REQUIRED BY THE REMOVAL OF EQUIPMENT, DUCTWORK, AND ACCESSORIES. PATCHING SHALL MATCH EXISTING CONSTRUCTION & FINISHES. COORDINATE ALL PATCHING AND FINISHES WITH ARCHITECT. PATCHING OF FIRE WALLS SHALL MEET THE RATING AND SHALL BE INSTALLED PER ARCHITECTURAL SPECIFICATION.

D. REMOVAL OF EXISTING EQUIPMENT, PIPING OR DUCTWORK SHALL BE MADE SO THAT SERVICE TO OTHER AREAS UTILIZED BY THE OWNER ARE NOT INTERRUPTED WITHOUT CONSENT FROM OWNER. PROVIDE TEMPORARY VALVES AND TEMPORARY SERVICES REQUIRED DURING REMOVALS AND CONSTRUCTION.

E. REMOVE COMPLETELY ALL EXISTING HVAC EQUIPMENT, ALL ASSOCIATED PIPING, CONTROLS, AND SUPPORTS BEING MADE OBSOLETE BY THIS CONSTRUCTION. REMOVAL OF HVAC DUCTWORK AND PIPING SHALL BE MADE BACK TO MAINS UNLESS INDICATED BY THE HATCHING.



FIRST FLOOR HVAC PLAN - BASE BID

SCALE: 1/8" = 1'-0"

KEYNOTES:

1. CONTRACTOR TO PIPE REFRIGERANT PER MANUFACTURER RECOMMENDATIONS.
2. CONTRACTOR TO PROVIDE FURNACE WITH CONCENTRIC VENT KIT AND TERMINATE AT SOUTH WALL.
3. CONTRACTOR TO PROVIDE CONDENSATE PUMP FOR AIR HANDLING UNIT AND ROUTE 3/4" CONDENSATE PIPE TO SOUTH WALL AND SPILL TO GRADE. REFER TO DETAIL LOCATED ON M0.1.
4. CONTRACTOR TO ROUTE 3/4" CONDENSATE PIPE TO JANITOR 106 AND SPILL TO MOP BASIN. MAINTAIN 1" AIR GAP. REFER TO DETAIL LOCATED ON M0.1.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

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Drawing

HVAC BASE BID

Scale	Job	Sheet
AS NOTED	19002	M1.0
Drawn: TLP	Date: 03/18/19	2 of 4

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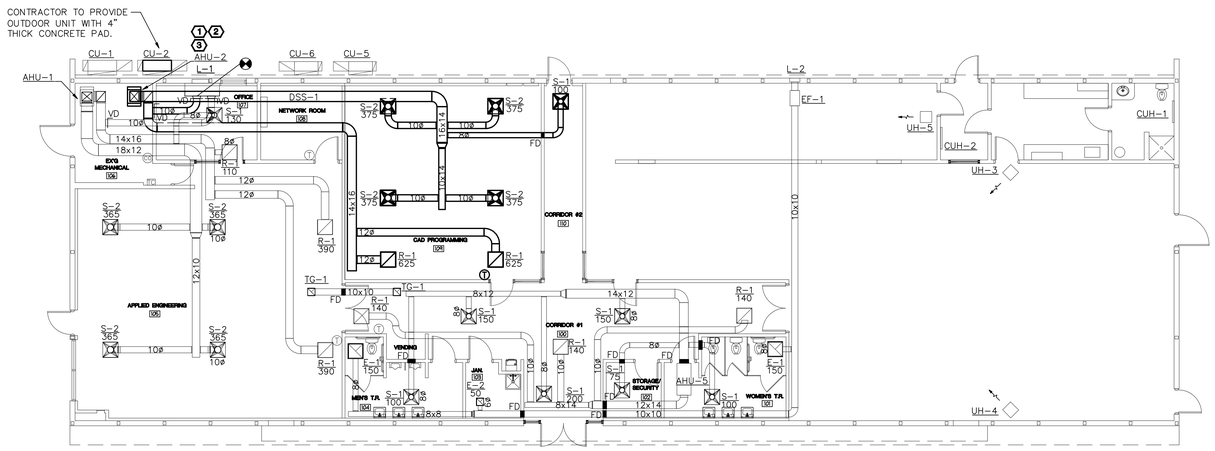

FIRST FLOOR HVAC PLAN - ALTERNATE 2

SCALE: 1/8" = 1'-0"

KEYNOTES:

1. CONTRACTOR TO PIPE REFRIGERANT PER MANUFACTURER RECOMMENDATIONS.
2. CONTRACTOR TO PROVIDE FURNACE WITH CONCENTRIC VENT KIT AND TERMINATE AT SOUTH WALL.
3. CONTRACTOR TO PROVIDE CONDENSATE PUMP FOR AIR HANDLING UNIT AND ROUTE 3/4" CONDENSATE PIPE TO SOUTH WALL AND SPILL TO GRADE REFER TO DETAIL LOCATED ON M0.1.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

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Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing		
HVAC ALTERNATE 2		
Scale AS NOTED	**Job** 19002	**Sheet** M2.0
Drawn TLP	**Date** 03/18/19	3 of 4

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Xrefs: 18280A01-BASE BID.dwg 18280A01-ALT 3.dwg 18280A01-ALT 2.dwg 18280M01.dwg 18280 ALTERNATE 2 DUCTWORK.dwg 18280 BASE BID DUCTWORK.dwg 18280E30.dwg
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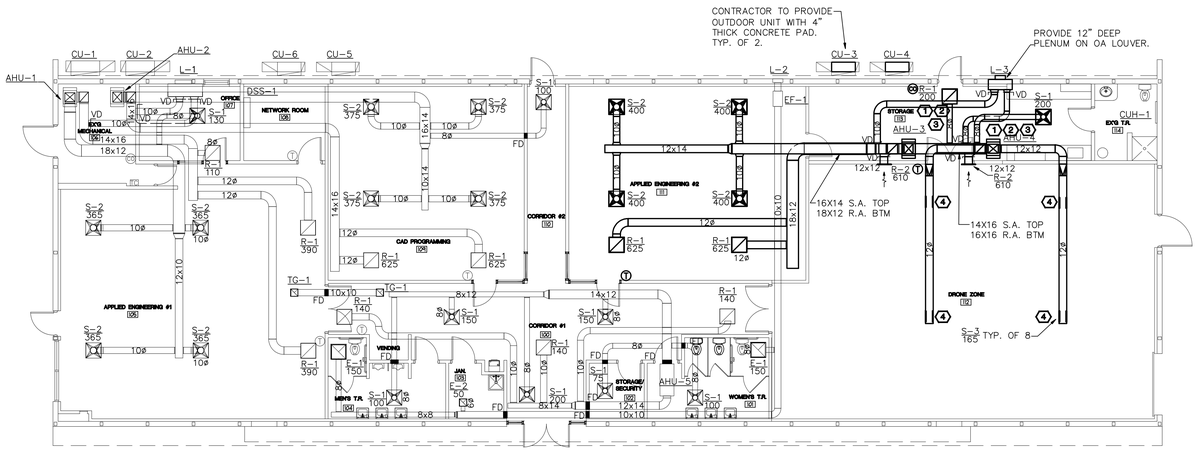

GENERAL NOTES:

1. CUH-2, UH-3, UH-4, AND UH-5 SHALL NOT BE INSTALLED IN ALTERNATE 3.

FIRST FLOOR HVAC PLAN - ALTERNATE 3

SCALE: ⅛" = 1'-0"

KEYNOTES:

1. CONTRACTOR TO PIPE REFRIGERANT PER MANUFACTURER RECOMMENDATIONS.
2. CONTRACTOR TO PROVIDE FURNACE WITH CONCENTRIC VENT KIT AND TERMINATE AT SOUTH WALL.
3. CONTRACTOR TO PROVIDE CONDENSATE PUMP FOR AIR HANDLING UNIT AND ROUTE 3/4" CONDENSATE PIPE TO SOUTH WALL AND SPILL TO GRADE. REFER TO DETAIL LOCATED ON M0.1.
4. DRUM LOUVERS TO BE MOUNTED AT 30° ANGLE.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
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TOTAL AREA OF RECONSTRUCTION: 6,342 SF

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3322 COLLEGE DR. VINELAND, NJ 08360

Drawing		
HVAC ALTERNATE 3		
Scale	**Job**	**Sheet**
AS NOTED	19002	M3.0
Drawn	**Date**	4 of 4
TLP	03/18/19	

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Layout Tabs: M3.0

SCHEDULE OF PLUMBING FIXTURES AND CONNECTIONS

MARK	FIXTURE	MANUFACTURER	MODEL NO.	TYPE	MATERIAL	STYLE	FAUCET / VALVE					SUPPLY STOPS MANUFACTURER AND MODEL	DRAIN				DOMESTIC CW	DOMESTIC HW	SANITARY WASTE	SANITARY VENT	REMARKS	MARK
							MANUFACTURER	MODEL NO.	SPOUT	HANDLES	CENTERS		TYPE	SIZE	P-TRAP	TAILPIECE						
EC1 (ADA)	ELECTRIC WATER COOLER	OASIS	PGF8AC	WALL MOUNT	BRUSHED STAINLESS STEEL	BARRIER FREE	---	---	---	---	---	ZURN Z81016-XL-LR-8860-12-PC	ZURN Z8746-PC	1¼"	17 GAUGE 1¼" X 1½"	---	½"	---	---	---	P-TRAP SHALL BE ADJUSTABLE CAST BRASS WITH CLEANOUT. MOUNT AT ADA HEIGHT.	EC1 (ADA)
HB1	HOSE BIBB	ZURN	Z875L7	WALL MOUNT	CHROME PLATED SOLID BRASS	LOOSE KEY HANDLE	---	---	---	---	---	---	---	---	---	---	½"	---	---	---	CERAMIC 1/4 TURN OPERATING CARTRIDGE WITH INTEGRAL VACUUM BREAKER. MOUNT 18" ABOVE FINISHED FLOOR IN RESTROOMS.	HB1
L1 (ADA)	LAVATORY	ZURN	Z5344	WALL MOUNT AT ADA HEIGHT	VITREOUS CHINA	20" x 18"	ZURN	Z81000-XL-18M	INTEGRAL WITH FAUCET	SINGLE LEVER	4"	ZURN Z81016-XL-LR-8860-12-PC	ZURN Z8746-PC	1¼"	17 GAUGE 1¼" X 1½"	OFFSET	½"	½"	1½"	1½"	P-TRAP SHALL BE ADJUSTABLE CAST BRASS WITH CLEANOUT. PROVIDE WITH THERMOSTATIC MIXING VALVE, CONCEALED ARM WALL CARRIER Z1231-EZR, AND ZURN Z8946-3-NT PROTECTIVE COVERINGS FOR ALL TAILPIECES, TRAP, SUPPLIES.	L1 (ADA)
MB1	MOP BASIN	ZURN	Z1996-24-MH-WG	FLOOR SET	HIGH DENSITY COMPOSITE BASIN	24"x24"x10"	ZURN	Z843M1-XL-CS-HCT-WHK-SH	¾" HOSE SPOUT WITH VACUUM BREAKER	LEVERS	8"	---	STAINLESS STEEL STRAINER	3"	---	---	¾"	¾"	3"	1½"	PROVIDE WITH 60" VINYL HOSE, HOSE BRACKET, VINYL BUMPER GUARD, 24"X24" WALL GUARDS, COMPLETE WITH PAIL HOOK AND WALL BRACE.	MB1
U1 (ADA)	URINAL	ZURN	Z5755-U	WALL HUNG FLUSH VALVE	VITREOUS CHINA	A.D.A. HEIGHT WASHDOWN FLUSH	ZURN	Z6003AV-WS1	---	LEVER	---	---	---	---	---	---	¾"	---	2"	1½"	¾" TOP SPUD W/1.0 GALLON FLUSH, ZURN 1222 FULLY ADJUSTABLE CARRIER, MODEL Z5978-STR STRAINER. URINAL TO BE MOUNTED AT ADA HEIGHT.	U1 (ADA)
U2	URINAL	ZURN	Z5755-U	WALL HUNG FLUSH VALVE	VITREOUS CHINA	WASHDOWN FLUSH	ZURN	Z6003AV-WS1	---	LEVER	---	---	---	---	---	---	¾"	---	2"	1½"	¾" TOP SPUD W/1.0 GALLON FLUSH, ZURN 1222 FULLY ADJUSTABLE CARRIER, MODEL Z5978-STR STRAINER.	U2
WC1 (ADA)	WATER CLOSET	ZURN	Z5551-K	FLOOR MOUNT FLUSH TANK	VITREOUS CHINA	A.D.A. ELONGATED SIPHON-JET	---	---	---	LEVER	---	ZURN Z81016-CR-8870-PC	---	---	---	---	½"	---	4"	2"	1.6 GALLON FLUSH. ZURN Z5955SS-EL-AM-STS SEAT. TOILET FLANGE BOLTS SHALL BE DOUBLE NUTTED.	WC1 (ADA)
WC2	WATER CLOSET	ZURN	Z5552-K	FLOOR MOUNT FLUSH TANK	VITREOUS CHINA	ELONGATED SIPHON-JET	---	---	---	LEVER	---	ZURN Z81016-CR-8870-12-PC	---	---	---	---	½"	---	4"	2"	1.6 GALLON FLUSH. ZURN Z5955SS-EL-AM-STS SEAT. TOILET FLANGE BOLTS SHALL BE DOUBLE NUTTED.	WC2

SCHEDULE OF PLUMBING DRAINS AND CLEANOUTS

MARK	FIXTURE	MANUFACTURER	MODEL NUMBER	TYPE	MATERIAL	STYLE	DRAIN SIZE	REMARKS	MARK
FD1	FLOOR DRAIN	ZURN	Z507	NO HUB OR NEO-LOCK	CAST IRON/ CAST IRON TOP	7" ROUND	PER DWGS.	PROVIDE COMPLETE WITH SURESEAL FLOOR DRAIN TRAP SEAL.	FD1
FD2	FLOOR DRAIN	ZURN	ZN415B	NO HUB OR NEO-LOCK	CAST IRON / NICKEL BRONZE TOP	6" ROUND	PER DWGS.	PROVIDE COMPLETE WITH SURESEAL FLOOR DRAIN TRAP SEAL.	FD2
FCO	FLOOR CLEANOUT	ZURN	ZN1400-VP-BP	NO HUB OR NEO-LOCK	CAST IRON / NICKEL BRONZE TOP	SCORIATED ROUND TOP	PER DWGS.	VANDAL RESISTANT SECURED TOP. PROVIDE NICKEL BRONZE TOP IN FINISHED AREAS.	FCO

SCHEDULE OF TEMPERATURE REGULATING VALVES

MARK	MANUFACTURER	MODEL NO.	SERVICE	FLOW @ 20 PSI PRESSURE DROP	MINIMUM FLOW	CIRCULATED FLOW	FINISH	INLET WATER CONNECTION	OUTLET WATER CONNECTION	REMARKS	MARK
TMV1	LEONARD	TM-420B-LF-DT	HOT WATER	26	1 GPM	---	ROUGH BRONZE	¾" w/INTEGRAL CHECK STOPS	1"	SET HOT WATER OUTPUT @ 120°F MAX. PROVIDE w/ 140° HW & CW INLET SUPPLY STRAINERS.	TMV1

SCHEDULE OF DOMESTIC WATER HEATERS

MARK	MANUFACTURER	MODEL NO.	TANK CAPACITY (GALLONS)	RECOVERY @ 100 °F TEMPERATURE RISE	KW INPUT	HOT WATER TEMP OUT	EFFICIENCY	REMARKS	MARK
DWH1	A.O. SMITH	DSE-30-3	30	12	3	140	277V/1/60	SEE BELOW	DWH1

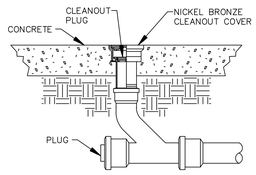
NOTES:
1. FUEL SOURCE SHALL BE ELECTRIC.
2. PROVIDE ASME RATED RELIEF VALVE FOR WATER HEATER.
3. PROVIDE ALL REQUIRED CLEARANCES AROUND WATER HEATER. CONTRACTOR SHALL VERIFY WATER HEATER WILL FIT IN ALLOTTED SPACE.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL STATE FORMS, SUBMITTALS, FEES, PERMITS, ETC. AS REQUIRED FOR WATER HEATER INSTALLATION.
5. BASIS OF DESIGN IS INDICATED IN SCHEDULE, REFER TO SPECIFICATIONS FOR OTHER APPROVED MANUFACTURERS. EQUIPMENT MUST MEET ALL THE PERFORMANCE REQUIREMENTS INDICATED

PLUMBING LEGEND

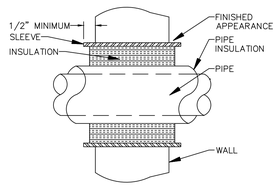
WC	WATER CLOSET – FLOOR SET FLUSH TANK
U	URINAL
L	LAVATORY
MB	MOP BASIN
EC	ELECTRIC WATER COOLER
FD	FLOOR DRAIN
CW	DOMESTIC COLD WATER
DWH	DOMESTIC WATER HEATER
EC	ELECTRIC WATER COOLER
EX	EXISTING
EW	EMERGENCY EYEWASH
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
G	NATURAL GAS
HA	HOUSE AIR
HAC	HOUSE AIR COMPRESSOR
HB	HOSE BIBB
HW	DOMESTIC HOT WATER
L	LAVATORY
MB	MOP BASIN
MW	MAKE-UP WATER
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
TD	TRENCH DRAIN
TMV	THERMOSTATIC MIXING VALVE
U	URINAL
V	SANITARY VENT
VTR	VENT THRU ROOF
W	SANITARY WASTE
WB	WASHER BOX
WC	WATER CLOSET
YCO	YARD CLEANOUT
BFF	BELOW FINISH FLOOR
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
F.F.E.	FINISHED FLOOR ELEVATION
I.E.	INVERT ELEVATION
O.F.C.I.	OWNER FURNISHED CONTRACTOR INSTALLED

	SANITARY WASTE
- - - - -	SANITARY VENT
CW	DOMESTIC COLD WATER
HW	DOMESTIC HOT WATER
G	NATURAL GAS
O	OXYGEN PIPE
	BALL VALVE
	SHUT-OFF VALVE
	CHECK VALVE
	PRESSURE REDUCING VALVE
	REDUCED PRESSURE BACKFLOW PREVENTER
	FLOW-IN DIRECTION OF ARROW
	VALVE IN VERTICAL
	RISER OR DROP
	BRANCH CONNECTION OFF TOP
	RISER DOWN
	RISER UP

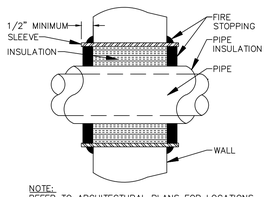
	THERMOMETER
	END CAP
	CONNECTION POINT– NEW TO EXISTING
	INDICATES REMOVAL
A	WATER HAMMER ARRESTER ZURN Z-1700 SIZE A-(100), B-(200), C-(300), D-(400)



FLOOR CLEANOUT DETAIL (FCO)
SCALE: NONE

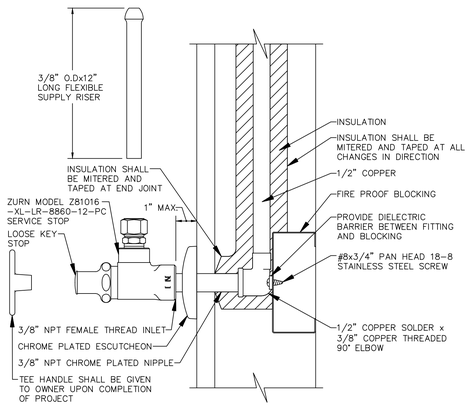


INTERIOR NON-RATED WALL PIPE SLEEVE DETAIL
SCALE: NONE



NOTE:
REFER TO ARCHITECTURAL PLANS FOR LOCATIONS.

INTERIOR RATED WALL PIPE SLEEVE DETAIL
SCALE: NONE



TYPICAL SERVICE STOP INSTALLATION DETAIL
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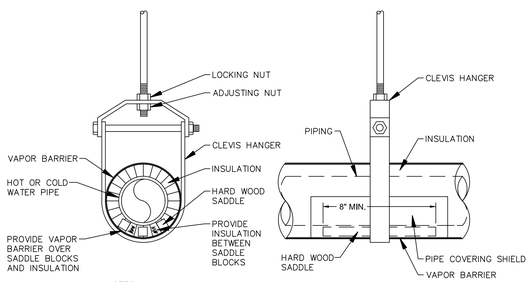
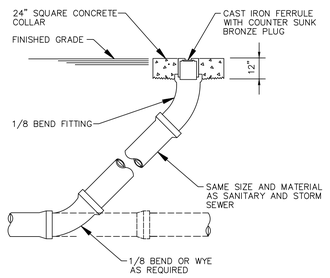
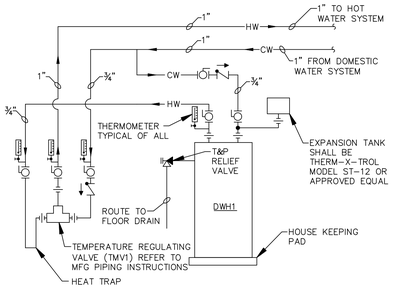


NOTES:
1. PROVIDE PIPE COVERING SHIELD AT EACH CLEVIS HANGER. INSTALL SHIELD BETWEEN VAPOR BARRIER AND CLEVIS HANGER.
2. THIS DETAIL IS TYPICAL FOR ALL OTHER HANGERS AND SUPPORTS.

TYPICAL INSULATED PIPE HANGER DETAIL
SCALE: NONE



TYPICAL YARD CLEANOUT (YCO)
SCALE: NONE



DOMESTIC WATER HEATER PIPING DIAGRAM
SCALE: NONE

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

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3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

PLUMBING SCHEDULE AND DETAILS

Scale	Job	Sheet
AS NOTED	19002	P0.1
Drawn	Date	1 of 6
GJW	03/18/19	

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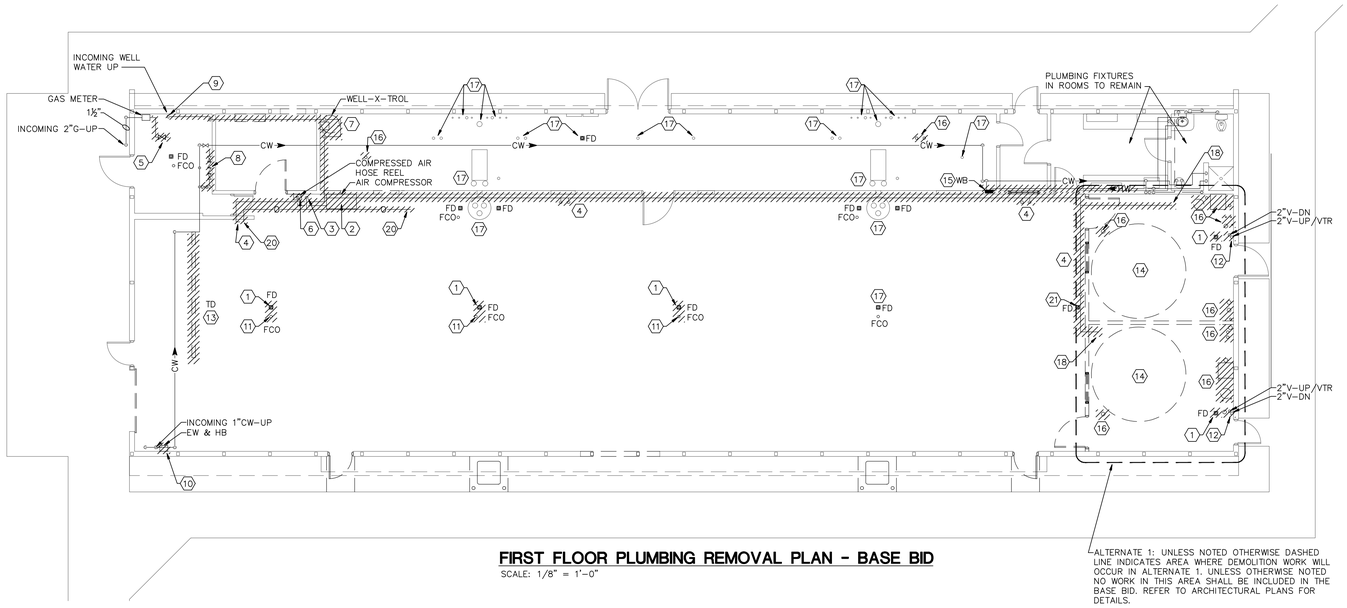
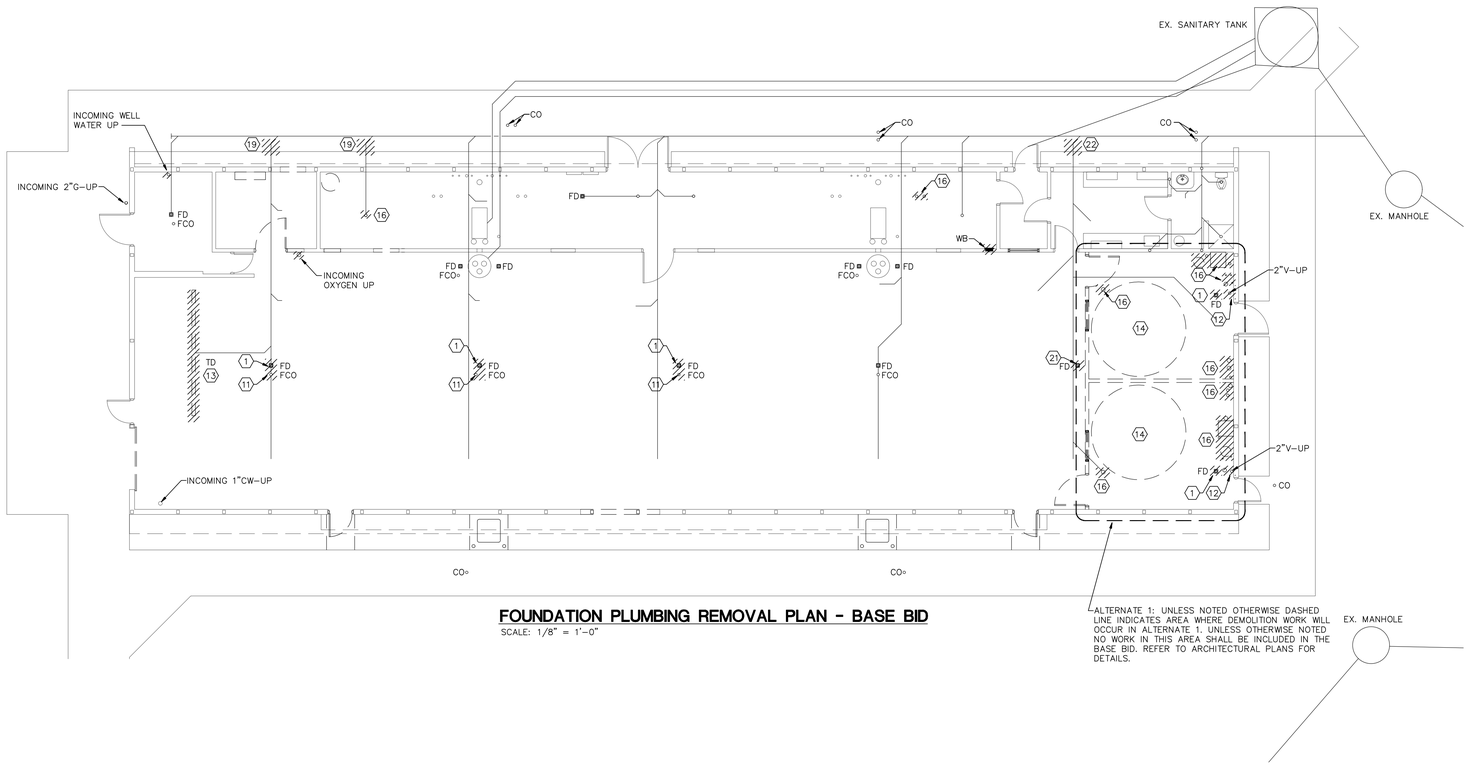
Xrefs: 18280A001-BASE BID.dwg 18280A001-ALT 1.dwg 18280A001-ALT 2.dwg 18280A001-ALT 3.dwg 18280P001.dwg
Layout Tab: P0.1



FIRST FLOOR PLUMBING REMOVAL PLAN - BASE BID

SCALE: 1/8" = 1'-0"



FOUNDATION PLUMBING REMOVAL PLAN - BASE BID

SCALE: 1/8" = 1'-0"

GENERAL PLUMBING REMOVAL NOTES:

A. THESE REMOVAL DRAWINGS SHALL SERVE TO AID THE CONTRACTOR IN HIS EVALUATION OF THE EXTENT OF REMOVALS, BUT SHALL NOT BE HELD TO BE ALL INCLUSIVE.

B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE BUILDING AND SITE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS, VERIFY SIZE, LOCATION, AND USAGE OF UTILITIES AND EQUIPMENT PRIOR TO REMOVAL.

C. FOR FURTHER INFORMATION WITH REGARD TO THE EXTENT OF REMOVALS, SEE THE NEW CONSTRUCTION PLANS WHICH ILLUSTRATE THE NEW CONSTRUCTION.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REMOVALS REQUIRED FOR THE INSTALLATION OF THE NEW WORK.

E. ALL PLUMBING FIXTURES INDICATED AS CROSS HATCHED OR NOTED, SHALL BE DISCONNECTED AND REMOVED.

F. THE CONTRACTOR SHALL REMOVE, BACK TO THE MAIN PIPING AND CAP, ALL WASTE, VENT AND WATER PIPING ASSOCIATED WITH THE REMOVED PLUMBING FIXTURES INDICATED AS CROSS HATCHED OR NOTED.

G. ALL EQUIPMENT REMOVED FOR RELOCATION SHALL BE REMOVED IN SUCH A MANNER THAT REUSE IS POSSIBLE.

H. CAP AND/OR PLUG WASTE, VENT & WATER PIPING VOIDED BY THE REMOVAL OF FIXTURES AND EQUIPMENT. PATCH ALL OPENINGS IN WALLS, FLOORS, AND CEILINGS WHERE THE REMOVAL OF PIPING, FIXTURES AND EQUIPMENT CREATES SUCH OPENINGS. PATCH OPENINGS TO MATCH EXISTING. PATCHING OF FIRE RATED WALLS AND CEILINGS SHALL MATCH THE FIRE RATING.

I. IF PORTIONS OF PIPING SERVING FIXTURES AND EQUIPMENT TO REMAIN MUST BE RELOCATED OR REMOVED DUE TO OTHER REMOVAL OR DUE TO INTERFERENCE WITH NEW FIXTURES AND EQUIPMENT INSTALLATION, THE PIPING SHALL BE MODIFIED IN SUCH A MANNER WHICH WILL ENSURE PROPER OPERATION OF THE FIXTURE AND EQUIPMENT AFTER CONSTRUCTION IS COMPLETE. USE THE SAME SIZE & TYPE PIPING AS THE EXISTING TO MAKE THE REQUIRED MODIFICATIONS. EXISTING PIPING EXPOSED DURING REMOVALS WHICH REMAIN TO SERVE FIXTURES AND EQUIPMENT SHALL BE RESUPPORTED IN ACCORDANCE WITH THE STATE PLUMBING CODE.

J. THE OWNER SHALL HAVE FIRST PREFERENCE TO ALL REMOVED ITEMS. ITEMS UNDESIRED BY THE OWNER SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE OWNER'S PROPERTY AND DISPOSED OF IN COMPLIANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

REMOVAL KEYED NOTES:

1. REMOVE FLOOR DRAIN COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
2. REMOVE AIR COMPRESSOR COMPLETE.
3. REMOVE PREVIOUSLY ABANDONED OXYGEN AND ASSOCIATED PVC PIPING FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB.
4. REMOVE WELL WATER PIPING COMPLETE.
5. REMOVE GAS PIPING AND ALL ACCESSORIES FROM BOILER BACK TO GAS METER COMPLETE. EXISTING METER TO REMAIN. PREPARE PIPING FOR NEW CONNECTION.
6. REMOVE COMPRESSED AIR HOSE REEL AND ALL ASSOCIATED PIPING COMPLETE.
7. REMOVE WELL-X-TROL AND ALL ASSOCIATED WELL WATER PIPING COMPLETE.
8. REMOVE BOILER MAKE UP WATER PIPING, BACKFLOW PREVENTER, AND ALL ACCESSORIES TO MAIN AND CAP.
9. REMOVE WELL WATER PIPING FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB.
10. REMOVE EMERGENCY EYEWASH, HOSE BIBB, AND ASSOCIATED PIPING TO INCOMING DOMESTIC COLD WATER MAIN AND CAP. INCOMING MAIN TO REMAIN.
11. REMOVE FLOOR CLEANOUT COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
12. REMOVE VENT PIPING FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB. REMOVE VENT THRU ROOF. PATCH ROOF TO MATCH EXISTING.
13. REMOVE TRENCH DRAIN COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
14. REMOVE ALL EXISTING BUILDING SYSTEM PIPING ASSOCIATED WITH TANK FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB.
15. REMOVE WASHER BOX COMPLETE. REMOVE WASTE PIPING TO BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING. REMOVE VENT, HOT AND COLD WATER TO MAINS AND CAP. FIELD VERIFY EXACT ROUTING OF EXISTING VENT.
16. REMOVE ALL EXISTING BUILDING SYSTEM PIPING AND VENTS FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB. REMOVE ALL EXISTING BUILDING SYSTEM FLOOR DRAINS AND CLEANOUTS TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
17. EXISTING BUILDING SYSTEM PIPING, VENTS, DRAINS, AND CLEANOUTS TO REMAIN.
18. REMOVE WELL WATER PIPING COMPLETE. INCLUDE IN BASE BID.
19. REMOVE SANITARY PIPING AND CAP BOTH ENDS OF PIPE. REMAINING PIPING TO BE ABANDONED IN PLACE. FIELD VERIFY EXACT LOCATION. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION AND BACKFILL ASSOCIATED WITH THE CAPPING OF THE SANITARY PIPING. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO BE RESPONSIBLE FOR REPAIRS FOR ANY DAMAGE TO SIDEWALK.
20. REMOVE PREVIOUSLY ABANDONED OXYGEN PIPING COMPLETE.
21. BASE BID: EXISTING FLOOR DRAIN TO REMAIN. ALTERNATE 1: REMOVE FLOOR DRAIN COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
22. BASE BID: EXISTING SANITARY PIPING TO REMAIN. ALTERNATE 1: REMOVE SANITARY PIPING AND CAP BOTH ENDS OF PIPE. REMAINING PIPING TO BE ABANDONED IN PLACE. FIELD VERIFY EXACT LOCATION. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION AND BACKFILL ASSOCIATED WITH THE CAPPING OF THE SANITARY PIPING. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO BE RESPONSIBLE FOR REPAIRS FOR ANY DAMAGE TO SIDEWALK.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing		
FIRST FLOOR PLUMBING REMOVAL PLAN - BASE BID AND ALTERNATE 1		
Scale AS NOTED	**Job** 19002	**Sheet** P1.0
Drawn GJW	**Date** 03/18/19	2 of 6

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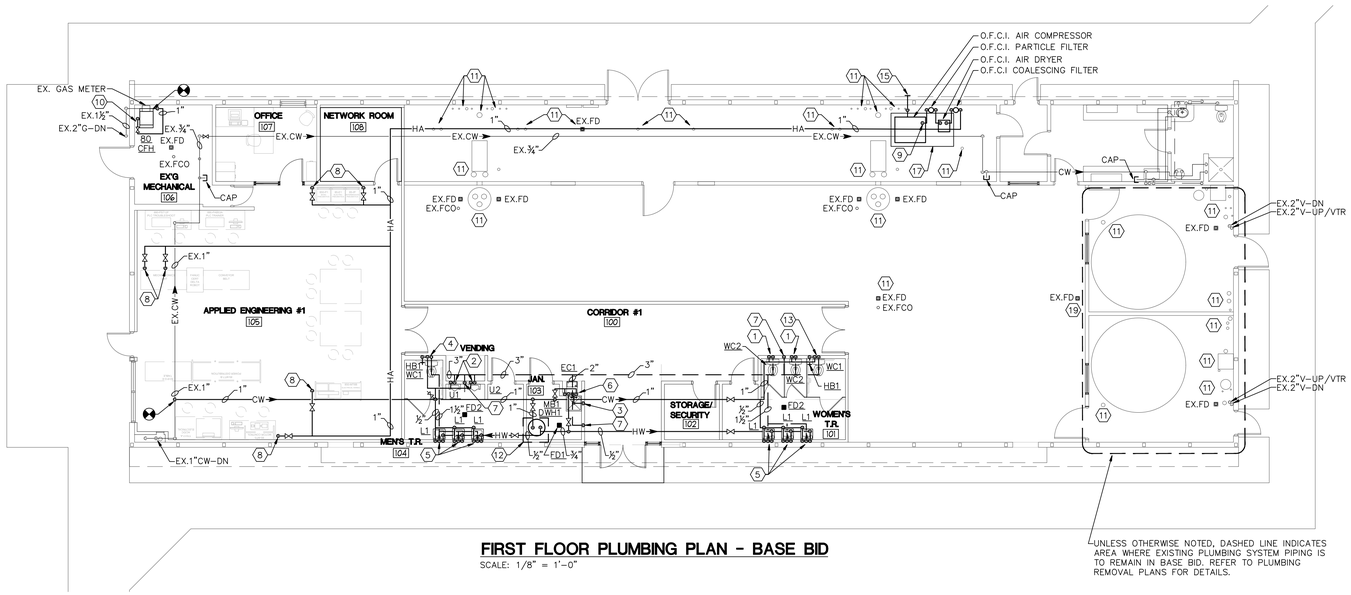


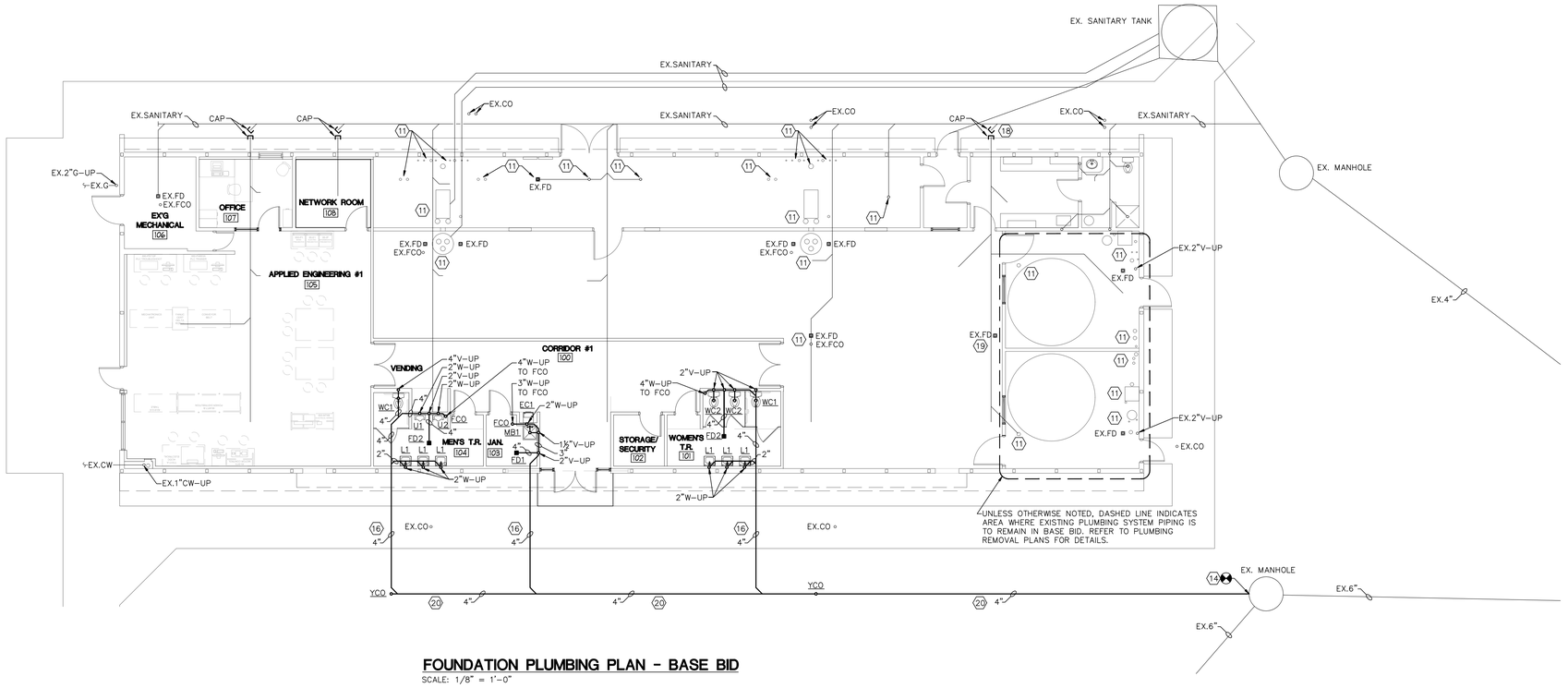
FIRST FLOOR PLUMBING PLAN - BASE BID

SCALE: 1/8" = 1'–0"

UNLESS OTHERWISE NOTED, DASHED LINE INDICATES AREA WHERE EXISTING PLUMBING SYSTEM PIPING IS TO REMAIN IN BASE BID. REFER TO PLUMBING REMOVAL PLANS FOR DETAILS.

KEYED NOTES:

1. 2" VENT, ½" COLD WATER DOWN TO FIXTURE.
2. 1½" VENT, ¾" COLD WATER DOWN TO FIXTURE. PROVIDE WATER HAMMER ARRESTOR.
3. 1½" VENT, ¾" HOT AND COLD WATER DOWN TO MOP BASIN.
4. 4" VENT, ½" COLD WATER DOWN TO FIXTURE. ½" COLD WATER TO HOSE BIBB. 4" VENT UP. 4" VENT THRU ROOF.
5. 1½" VENT, ½" HOT AND COLD WATER DOWN TO FIXTURE.
6. 1½" VENT, ½" COLD WATER DOWN TO WATER COOLER.
7. 2" VENT DOWN TO FLOOR DRAIN.
8. ¾" COMPRESSED AIR DOWN TO O.F.C.I. MILTON INDUSTRIES COMBINATION FILTER REGULATOR. PROVIDE ISOLATION VALVE AND DRIP LEG. CONNECT TO CLASSROOM EQUIPMENT. COORDINATE WITH EQUIPMENT MANUFACTURER FOR FINAL CONNECTION.
9. ROUTE ¾" COMPRESSED AIR DOWN FROM AIR COMPRESSOR TO PARTICLE FILTER TO AIR DRYER TO COALESCING FILTER. INSTALL PER MANUFACTURER'S RECOMMENDATIONS. EXTEND 1" COMPRESSED AIR FROM COALESCING FILTER TO REST OF BUILDING COMPRESSED AIR SYSTEM AS INDICATED.
10. 1" GAS TO AIR HANDLING UNIT. PROVIDE WITH UNION, GAS VALVE, AND DIRT LEG.
11. EXISTING BUILDING SYSTEM PIPING, VENTS, DRAINS, AND CLEANOUTS TO REMAIN.
12. SEE DOMESTIC WATER HEATER DIAGRAM FOR PIPING ARRANGEMENT IN THIS AREA.
13. 2" VENT, ½" COLD WATER DOWN TO FIXTURE. ½" COLD WATER TO HOSE BIBB.
14. PROVIDE DROP INLET. MODIFY MANHOLE AND BOTTOM OF MANHOLE TO ACCOMMODATE NEW SANITARY CONNECTION.
15. 2" REMOTE AIR INLET FOR OWNER FURNISHED, CONTRACTOR INSTALLED AIR COMPRESSOR. PROVIDE INGERSOLL RAND AIR FILTER AND HOOD, OR EQUIVALENT. PROVIDE DRIP LEG. INSTALL PER INGERSOLL RAND AIR COMPRESSOR MODEL 2475N7.5V INSTALLATION RECOMMENDATIONS.
16. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION, TRENCH WORK, AND BACKFILL ASSOCIATED WITH NEW SANITARY PIPE BELOW SIDEWALK. INSTALL PER STATE CODE. CONTRACTOR TO BE RESPONSIBLE FOR REPAIRS FOR ANY DAMAGE TO THE SIDEWALK.
17. CONTRACTOR TO PROVIDE AND INSTALL 4" THICK, REINFORCED, AND DOWELED INTO FLOOR 4'x8' CONCRETE HOUSEKEEPING PAD FOR NEW AIR COMPRESSOR AND DRYER.
18. BASE BID: EXISTING SANITARY PIPING TO REMAIN. ALTERNATE 1: EXISTING PIPING TO BE REMOVED AND CAPPED. REFER TO DEMOLITION PLANS.
19. BASE BID: EXISTING FLOOR DRAIN TO REMAIN. ALTERNATE 1: EXISTING FLOOR DRAIN TO BE REMOVED. REFER TO DEMOLITION PLANS.
20. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION, TRENCH WORK, AND BACKFILL ASSOCIATED WITH NEW SANITARY PIPE. CONTRACTOR TO RESEED AREA WITH GRASS TO MATCH EXISTING SURROUNDING AREAS. INSTALL PER STATE CODE.



FOUNDATION PLUMBING PLAN - BASE BID

SCALE: 1/8" = 1'–0"

UNLESS OTHERWISE NOTED, DASHED LINE INDICATES AREA WHERE EXISTING PLUMBING SYSTEM PIPING IS TO REMAIN IN BASE BID. REFER TO PLUMBING REMOVAL PLANS FOR DETAILS.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
1138 East Chestnut Avenue | Vineland, New Jersey 08360
p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

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Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing PLUMBING PLANS - BASE BID		
Scale AS NOTED	**Job** 19002	**Sheet** P1.1
Drawn GJW	**Date** 03/18/19	3 of 6

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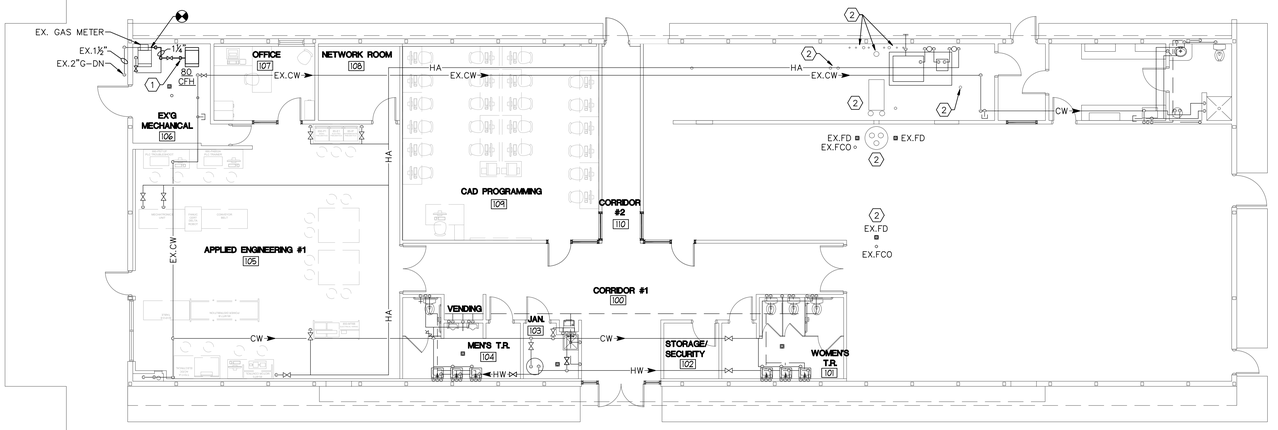
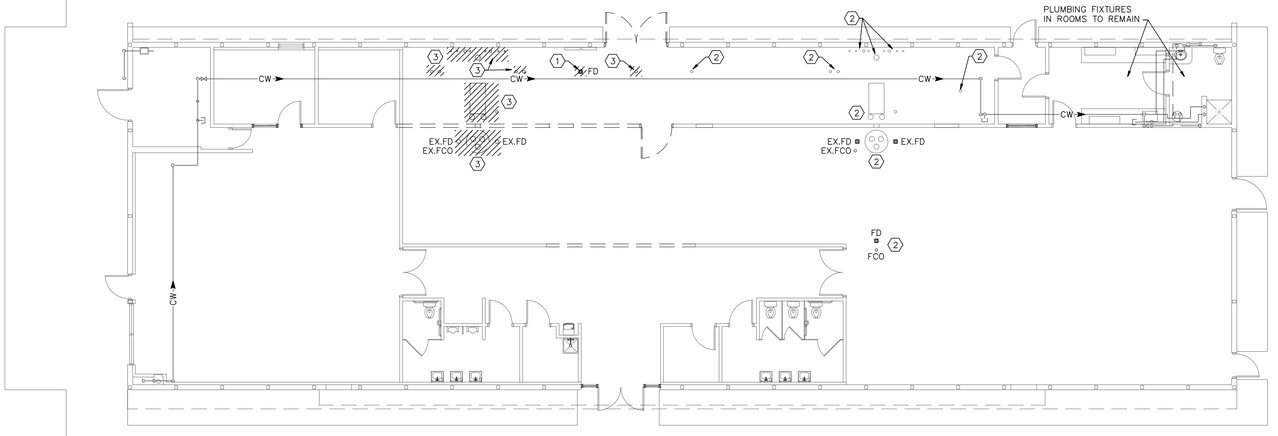


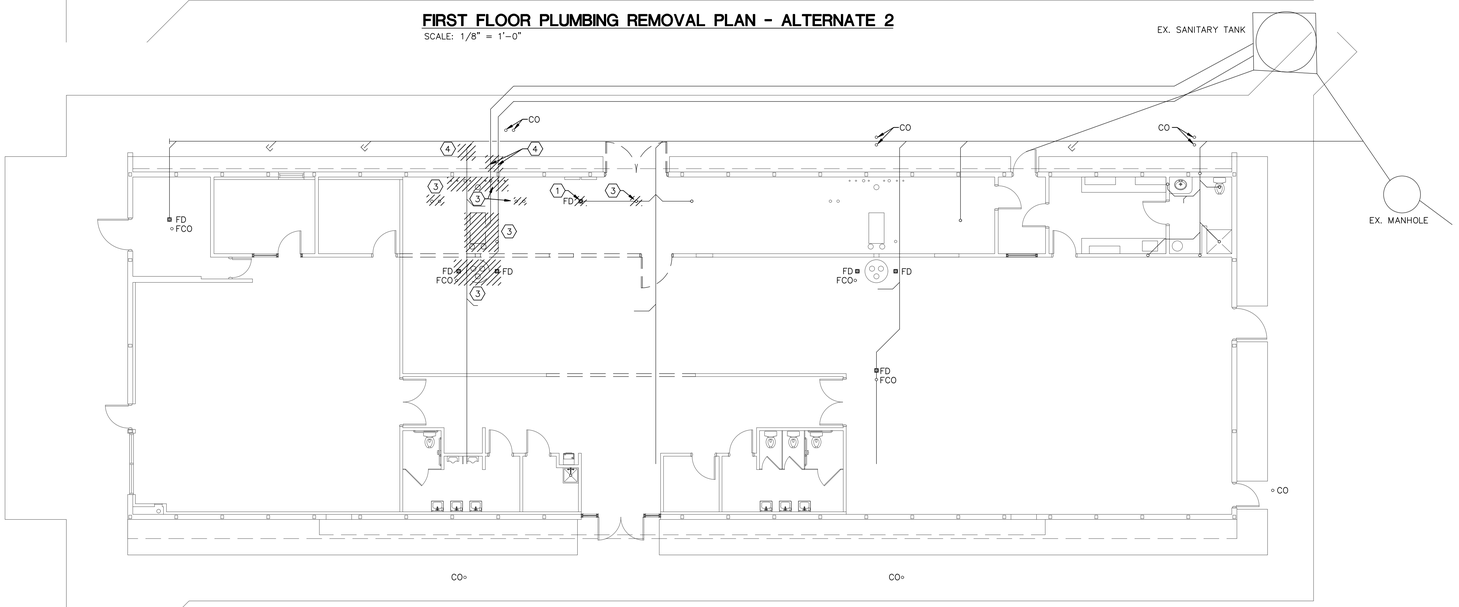
FIRST FLOOR PLUMBING PLAN - ALTERNATE 2

SCALE: 1/8" = 1'-0"



FIRST FLOOR PLUMBING REMOVAL PLAN - ALTERNATE 2

SCALE: 1/8" = 1'-0"



FOUNDATION PLUMBING REMOVAL PLAN - ALTERNATE 2

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

A. ALTERNATE 2 NEW PLUMBING WORK INVOLVES PROVIDING A GAS CONNECTION TO ADDITIONAL AIR HANDLING UNIT IN EXISTING MECHANICAL ROOM 106. SEE PLANS AND KEYED NOTES FOR PIPE ROUTING, SIZING, AND DETAILS.

KEYED NOTES:

1. 1" GAS TO AIR HANDLING UNIT. PROVIDE WITH UNION, GAS VALVE, AND DIRT LEG.
2. EXISTING BUILDING SYSTEM PIPING, VENTS, DRAINS, AND CLEANOUTS. TO REMAIN

REMOVAL KEYED NOTES:

1. REMOVE FLOOR DRAIN COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
2. EXISTING BUILDING SYSTEM PIPING, VENTS, DRAINS, AND CLEANOUTS TO REMAIN.
3. REMOVE ALL EXISTING BUILDING SYSTEM PIPING AND VENTS FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB. REMOVE ALL EXISTING BUILDING SYSTEM FLOOR DRAINS AND CLEANOUTS TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
4. REMOVE SANITARY PIPING AND CAP BOTH ENDS OF PIPE. REMAINING PIPING TO BE ABANDONED IN PLACE. FIELD VERIFY EXACT LOCATION. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION AND BACKFILL ASSOCIATED WITH THE CAPPING OF THE SANITARY PIPING. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO BE RESPONSIBLE FOR REPAIRS FOR ANY DAMAGE TO SIDEWALK.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

mmpf architects

Manders Merighi Portadin Farrell Architects, LLC
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p. 856 696 9155 | f. 856 696 9080 www.mmpfa.com

David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
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Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

PLUMBING PLANS - ALTERNATE 2

Scale	Job	Sheet
AS NOTED	19002	P2.0
Drawn: GJW	Date: 03/18/19	4 of 6

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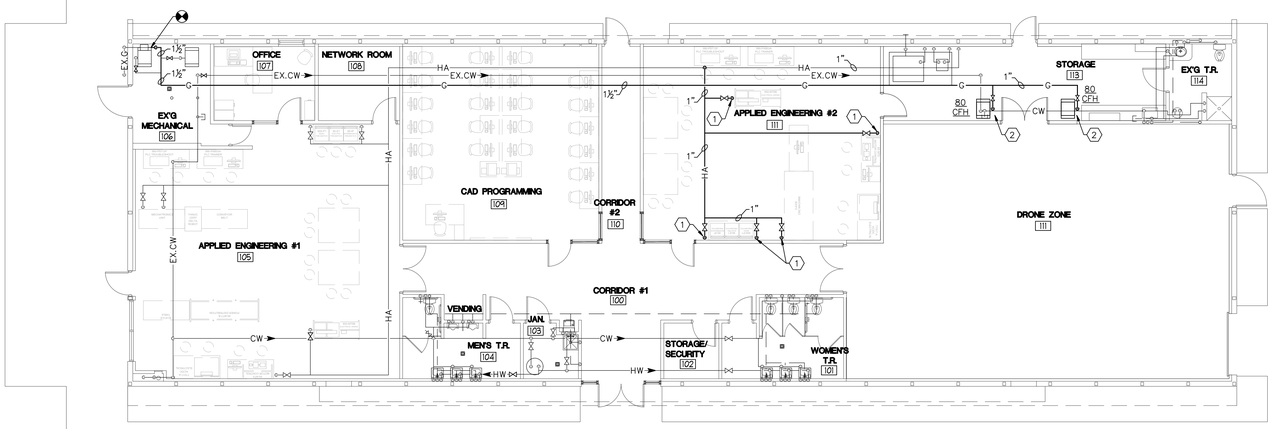
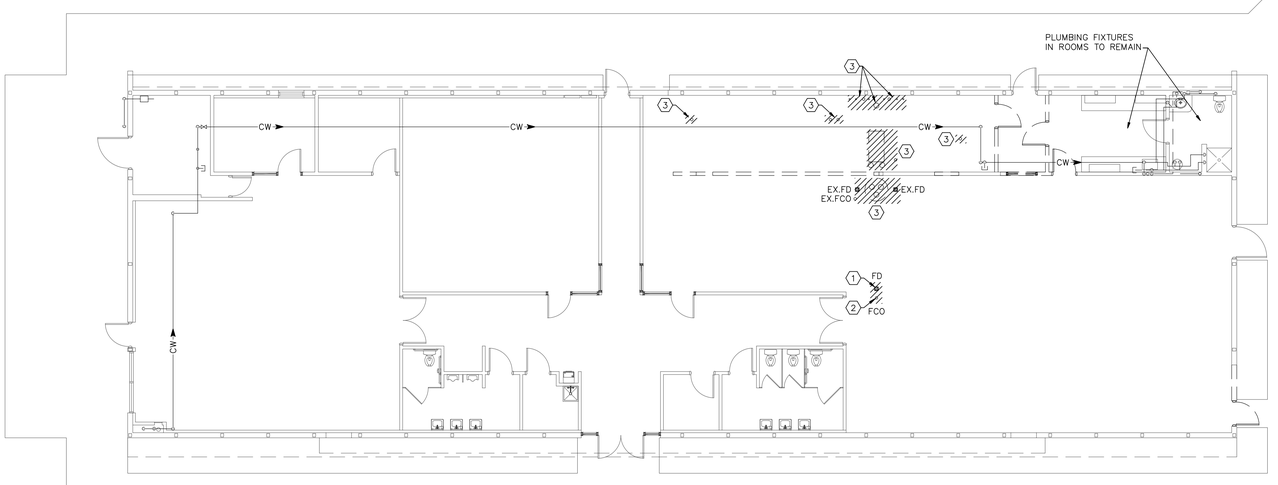


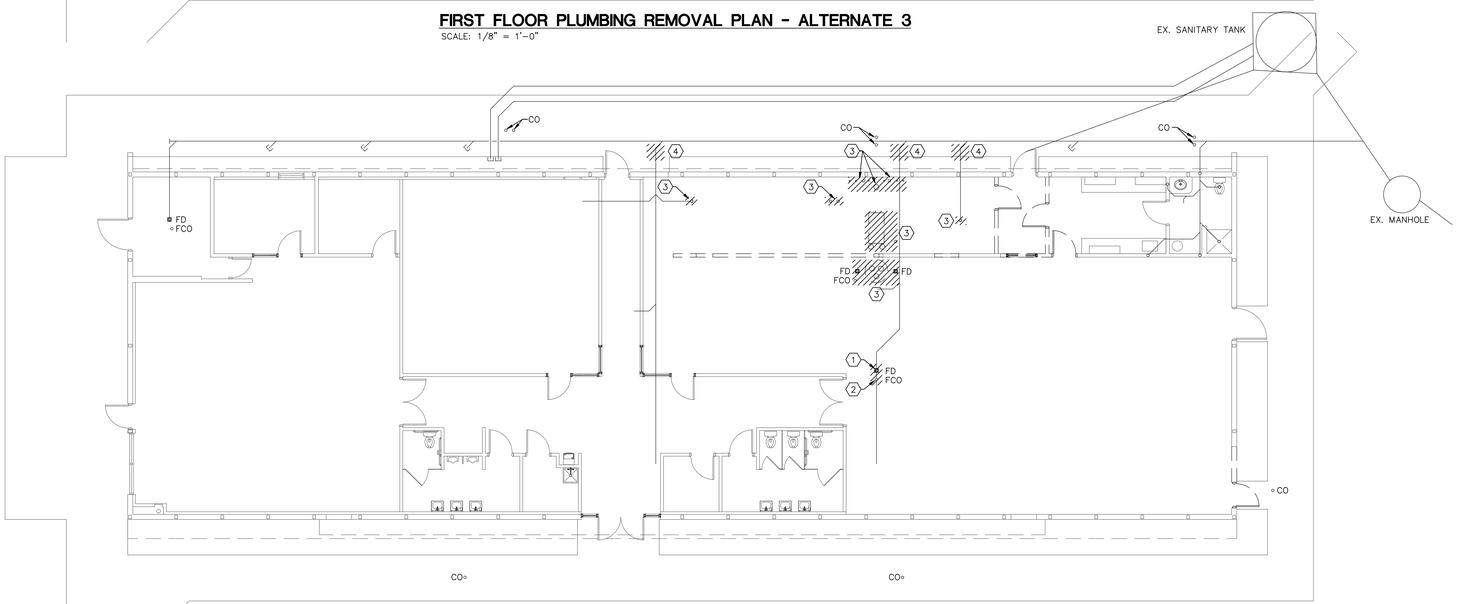
FIRST FLOOR PLUMBING PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"



FIRST FLOOR PLUMBING REMOVAL PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"



FOUNDATION PLUMBING REMOVAL PLAN - ALTERNATE 3

SCALE: 1/8" = 1'-0"

EX. MANHOLE

GENERAL NOTES:

A. ALTERNATE 3 NEW PLUMBING WORK INVOLVES PROVIDING GAS CONNECTIONS TO ADDITIONAL AIR HANDLING UNITS IN STORAGE ROOM 113. WORK ALSO INVOLVES PROVIDING AIR DROPS FOR APPLIED ENGINEERING #2 ROOM 111 . SEE PLANS AND KEYED NOTES FOR PIPE ROUTING, SIZING, AND DETAILS.

KEYED NOTES:

1. ¾" COMPRESSED AIR DOWN TO O.F.C.I. MILTON INDUSTRIES COMBINATION FILTER REGULATOR. PROVIDE ISOLATION VALVE AND DRIP LEG. CONNECT TO CLASSROOM EQUIPMENT. COORDINATE WITH EQUIPMENT MANUFACTURER FOR FINAL CONNECTION.
2. 1" GAS TO AIR HANDLING UNIT. PROVIDE WITH UNION, GAS VALVE, AND DIRT LEG.

REMOVAL KEYED NOTES:

1. REMOVE FLOOR DRAIN COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
2. REMOVE FLOOR CLEANOUT COMPLETE. REMOVE WASTE PIPING TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
3. REMOVE ALL EXISTING BUILDING SYSTEM PIPING AND VENTS FLUSH WITH TOP OF SLAB. PLUG AND FILL PIPE WITH CONCRETE FLUSH WITH TOP OF SLAB. REMOVE ALL EXISTING BUILDING SYSTEM FLOOR DRAINS AND CLEANOUTS TO 6" BELOW FLOOR AND CAP. PATCH FLOOR TO MATCH EXISTING.
4. REMOVE SANITARY PIPING AND CAP BOTH ENDS OF PIPE. REMAINING PIPING TO BE ABANDONED IN PLACE. FIELD VERIFY EXACT LOCATION. CONTRACTOR TO BE RESPONSIBLE FOR ALL EXCAVATION AND BACKFILL ASSOCIATED WITH THE CAPPING OF THE SANITARY PIPING. EXISTING SIDEWALK TO REMAIN. CONTRACTOR TO BE RESPONSIBLE FOR REPAIRS FOR ANY DAMAGE TO SIDEWALK.

Revisions

No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

USE GROUP: B – BUSINESS
CONSTRUCTION CLASSIFICATION: 5B

AREA OF RECONSTRUCTION:
BASE BID: 2,630 SF
ALTERNATE No. 2: 818 SF
ALTERNATE No. 3: 2,894 SF
TOTAL AREA OF RECONSTRUCTION: 6,342 SF

BCCLT CONSULTING ENGINEERS

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Project

RENOVATIONS TO:

ENGINEERING LAB

CUMBERLAND COUNTY COLLEGE
3322 COLLEGE DR. VINELAND, NJ 08360

Drawing

PLUMBING PLANS - ALTERNATE 3

Scale	Job	Sheet
AS NOTED	19002	P3.0
Drawn: GJW	Date: 03/18/19	5 of 6

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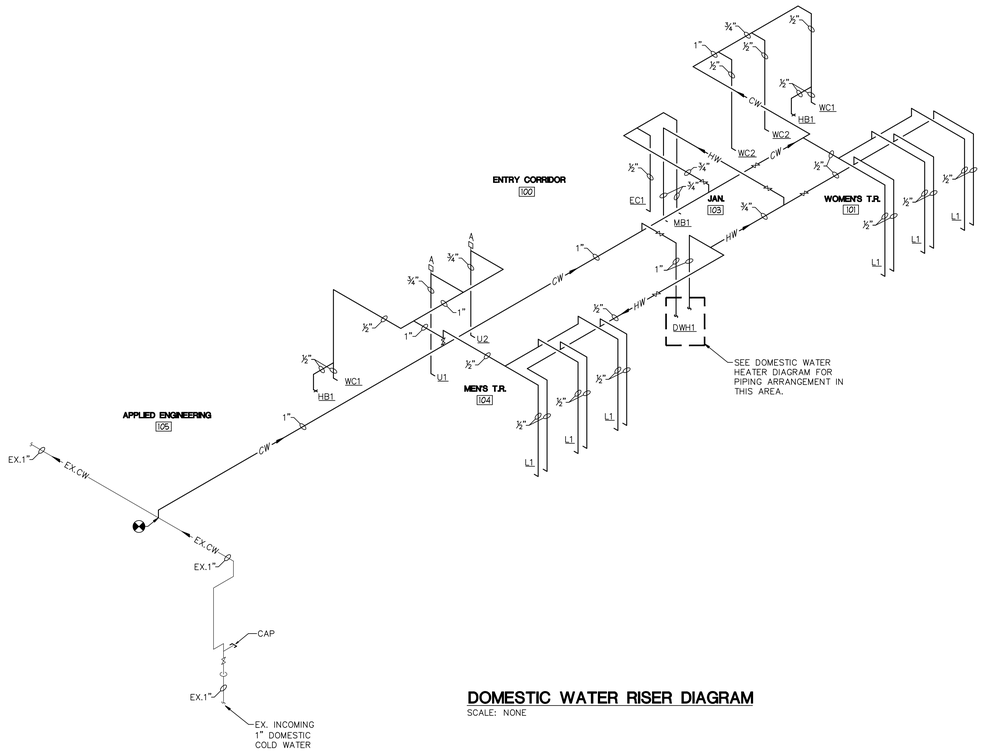

DOMESTIC WATER RISER DIAGRAM

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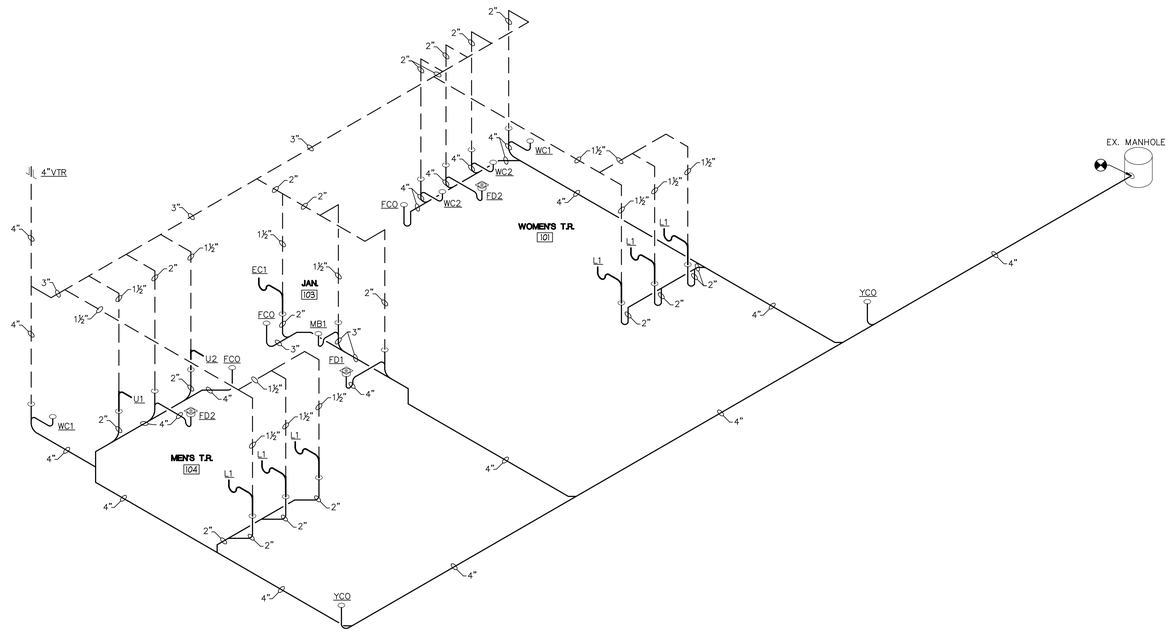

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Revisions		
No.	Date	Description

BUILDING DATA

UCC STATE OF NEW JERSEY – REHABILITATION SUBCODE NJAC 5:23.6, SUBCHAPTER 6 – RECONSTRUCTION

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Drawing		
PLUMBING RISER DIAGRAMS		
Scale	**Job**	**Sheet**
AS NOTED	19002	P4.0
Drawn	**Date**	6 of 6
GJW	03/18/19	

File Name: \\CLOUD\Groups\Projects\MMPF\18280 – Cumberland County College Applied Engineering Bldg\Plum\18280AX01-BASE BID.dwg 18280AX01-BASE BID.dwg 18280TB.dwg 18280AX01-ALT 1.dwg 18280AX01-ALT 1.dwg 18280AX01-ALT 2.dwg 18280AX01-ALT 2.dwg 18280AX01-ALT 3.dwg 18280AX01-ALT 3.dwg 18280P10.dwg
Plotted on: Mar 15, 2019 – 11:45am Plotted by:Wagner
Layout Tab: P4.0